EXHIBIT 2

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[45] **Date of Patent: Jan. 13, 1998**

[54] **INTERNET SERVER ACCESS CONTROL AND MONITORING SYSTEMS**

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[21] Appl. No.: **474,096**

[22] Filed: **Jun. 7, 1995**

[51] **Int. Cl.**^{6} **G06F 15/56**

[52] **U.S. Cl.** **395/200.12**; 395/200.15

[58] **Field of Search** 395/200.11, 200.12, 395/200.02, 200.05, 200.06, 200.09, 200.15; 380/23, 24, 25, 49; 340/825.34

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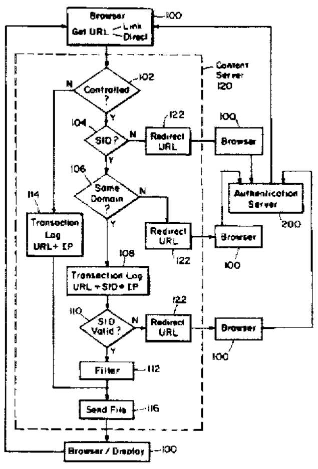
[57] **ABSTRACT**

This invention relates to methods for controlling and monitoring access to network servers. In particular, the process described in the invention includes client-server sessions over the Internet involving hypertext files. In the hypertext environment, a client views a document transmitted by a content server with a standard program known as the browser. Each hypertext document or page contains links to other hypertext pages which the user may select to traverse. When the user selects a link that is directed to an access-controlled file, the server subjects the request to a secondary server which determines whether the client has an authorization or valid account. Upon such verification, the user is provided with a session identification which allows the user to access to the requested file as well as any other files within the present protection domain.

45 Claims, 7 Drawing Sheets



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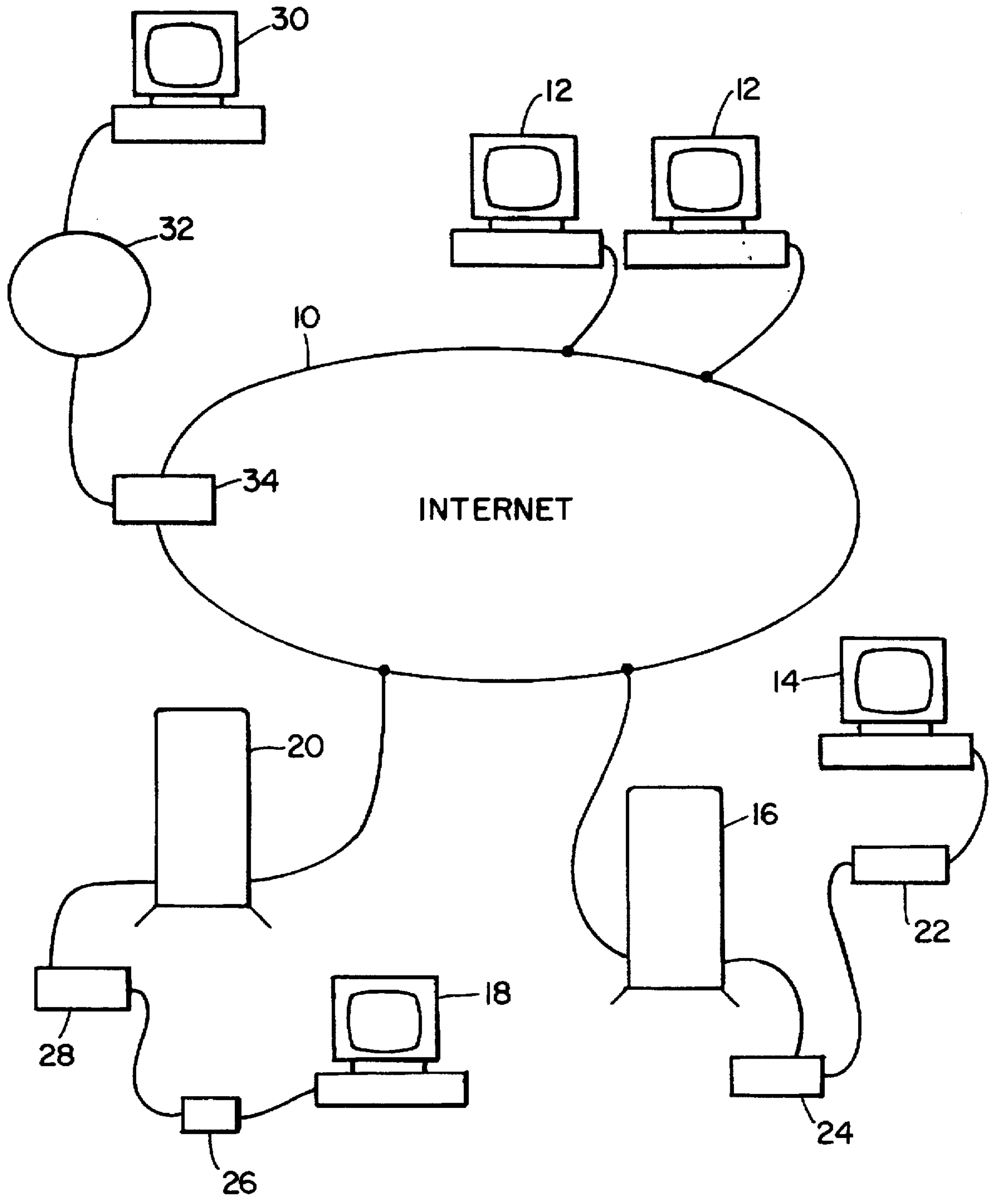


FIG. 1

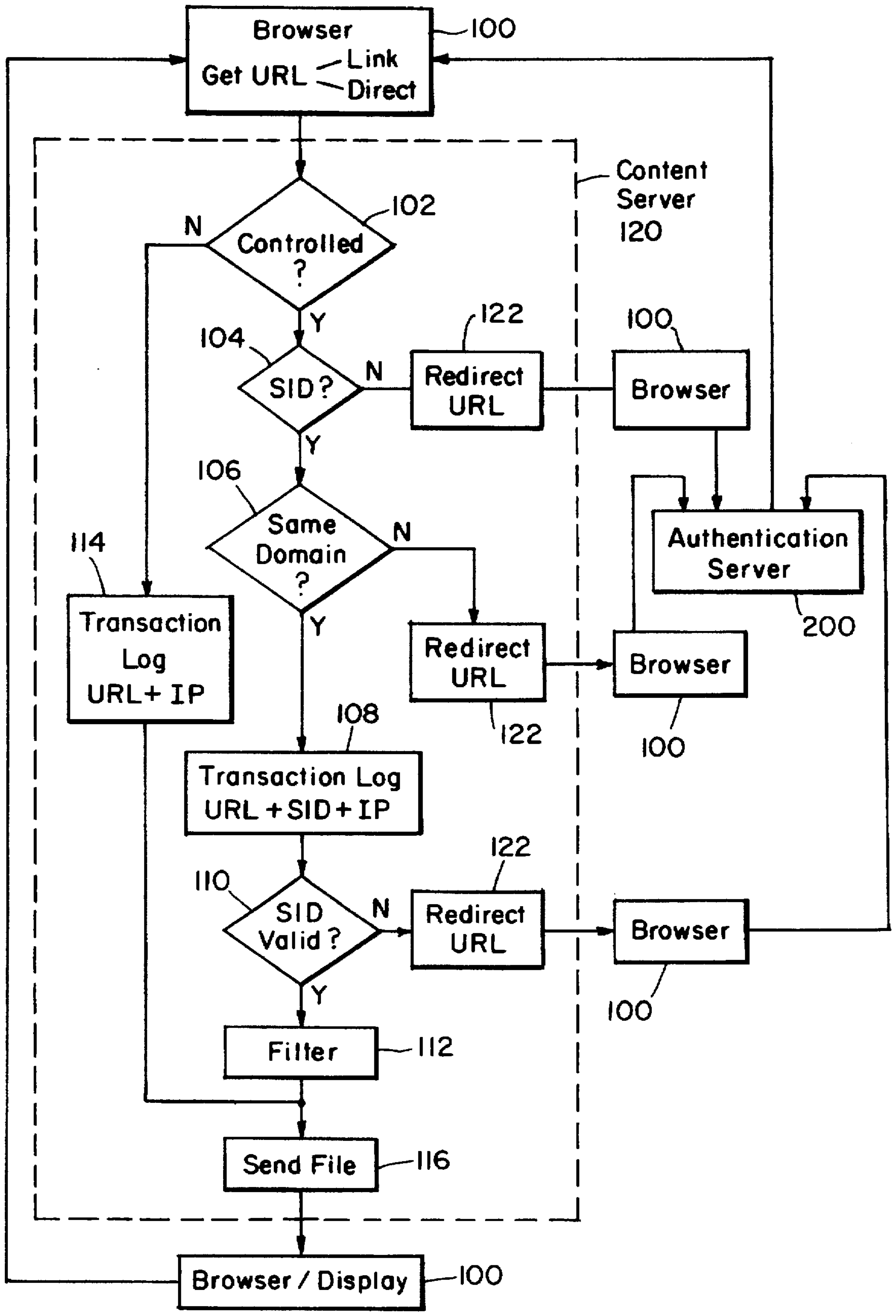

Browser
Get URL
Link
Direct
100
Content Server 120
Controlled ?
102
N
Y
104
SID ?
N
Y
122
Redirect URL
100
Browser
106
Same Domain ?
N
Y
Authentication Server
200
114
Transaction Log URL+ IP
Redirect URL
122
Browser
100
108
Transaction Log URL + SID + IP
110
SID Valid ?
N
Y
122
Redirect URL
Browser
100
Filter
112
Send File
116
Browser / Display
100

FIG. 2A

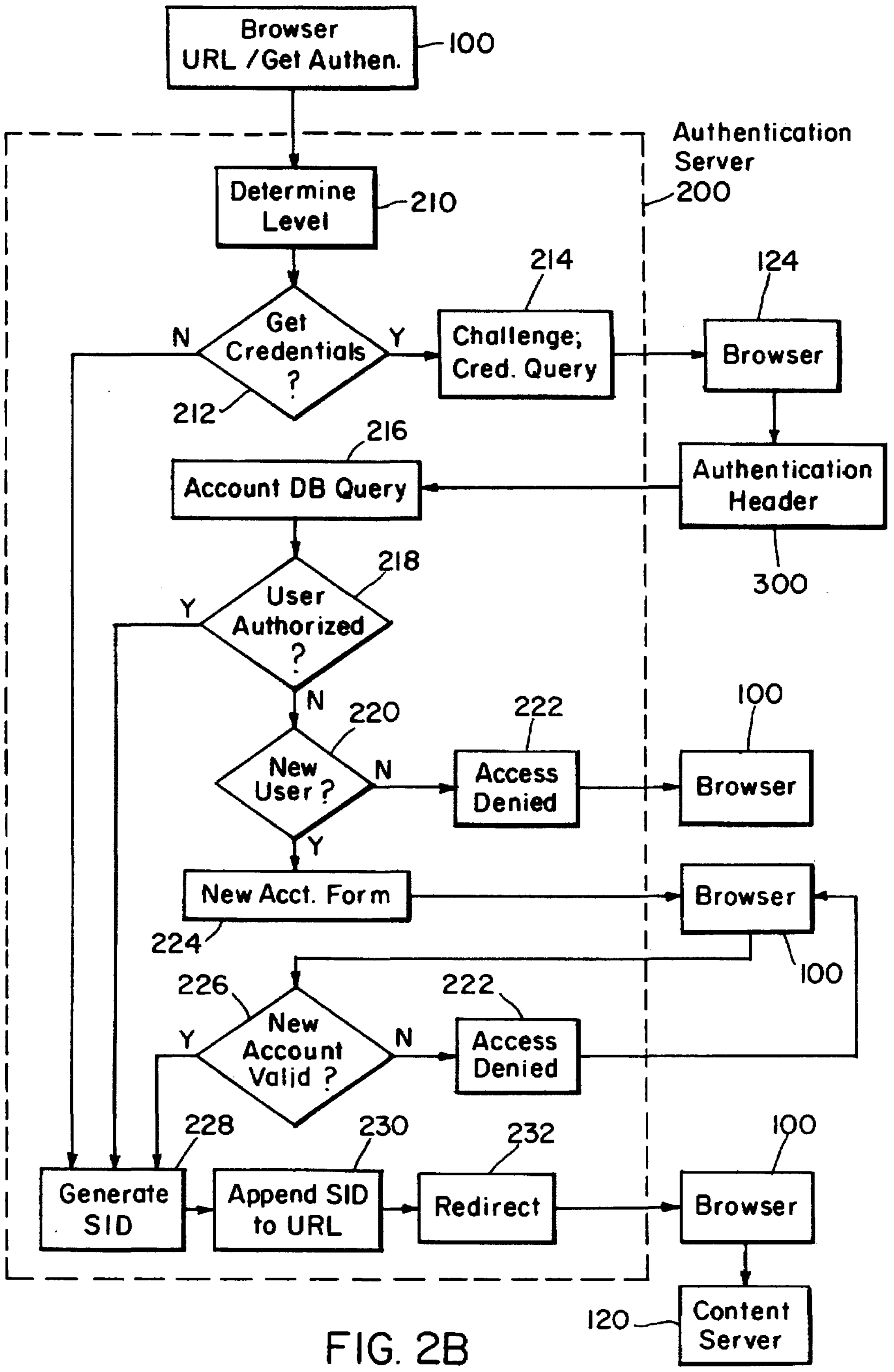
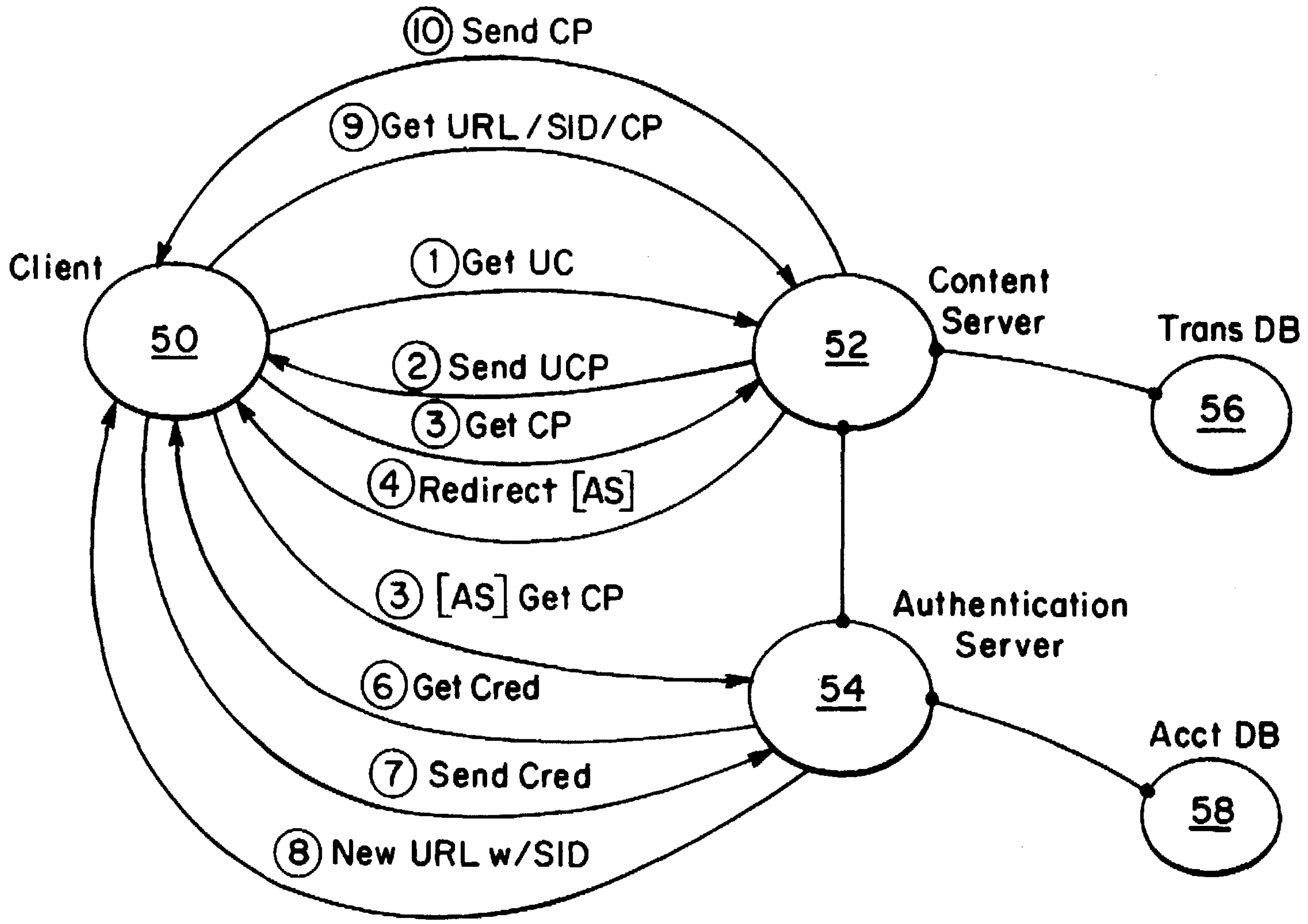

Browser URL / Get Authen.
100
Authentication Server
200
Determine Level
210
Get Credentials ?
212
N
Y
Challenge; Cred. Query
214
Browser
124
Authentication Header
300
Account DB Query
216
User Authorized ?
218
Y
N
New User ?
220
N
Y
Access Denied
222
Browser
100
New Acct. Form
224
Browser
100
New Account Valid ?
226
Y
N
Access Denied
222
Generate SID
228
Append SID to URL
230
Redirect
232
Browser
100
Content Server
120

FIG. 2B



10 Send CP
9 Get URL/SID/CP
Client
50
1 Get UC
2 Send UCP
3 Get CP
4 Redirect [AS]
52
Content Server
Trans DB
56
3 [AS] Get CP
6 Get Cred
7 Send Cred
8 New URL w/SID
54
Authentication Server
Acct DB
58

FIG. 3

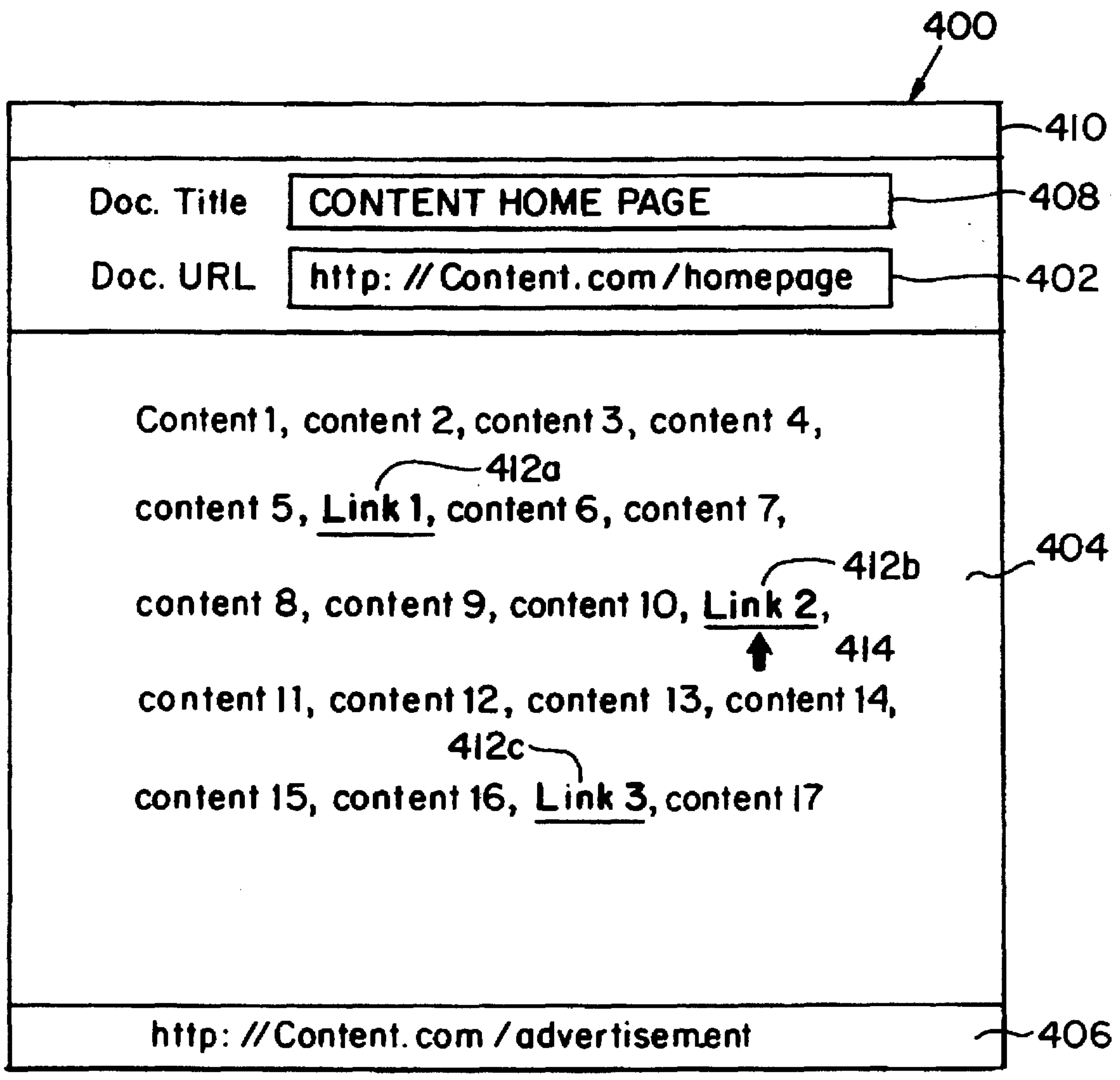
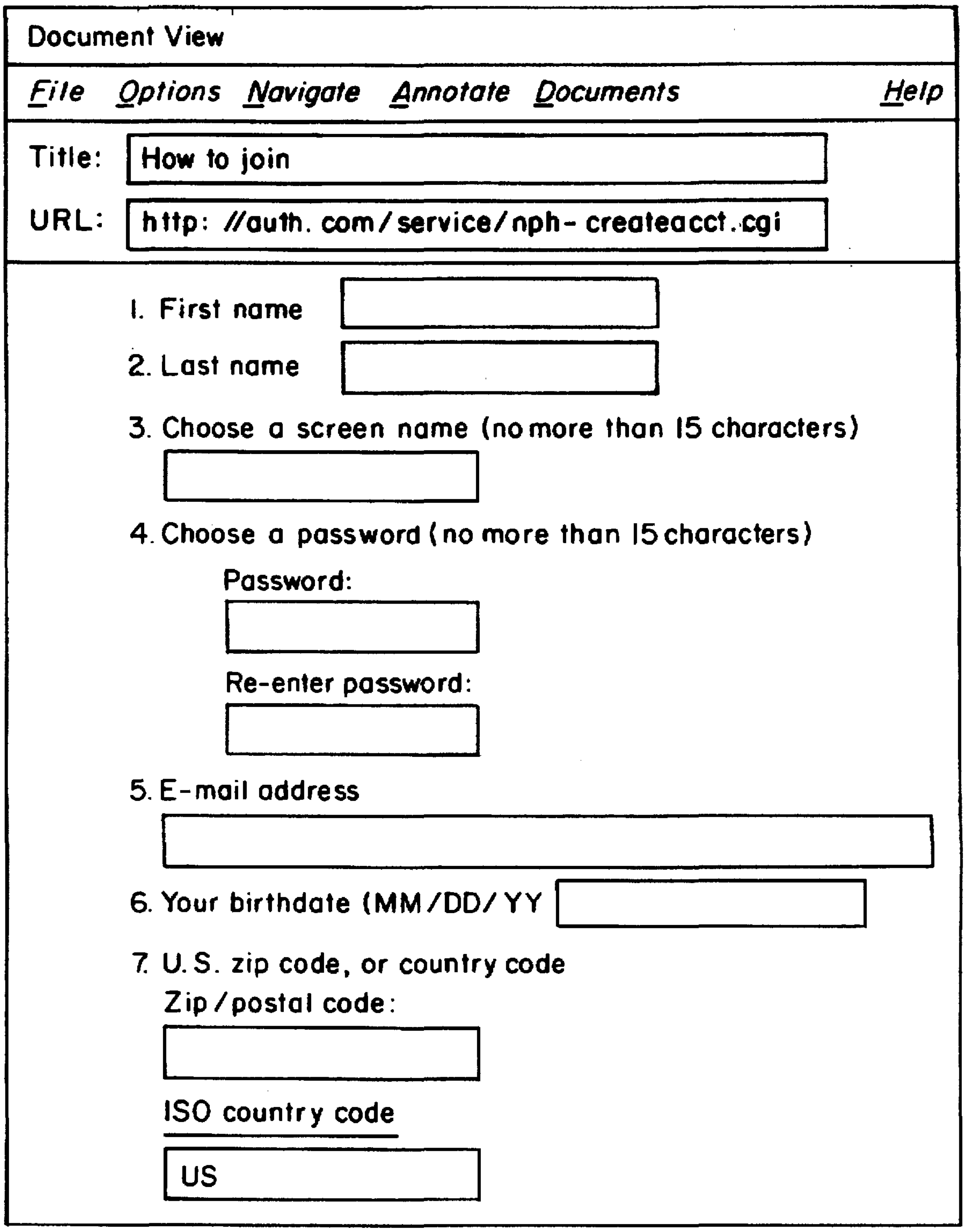

400
410
408
402
404
406
412a
412b
412c
414
Doc. Title
CONTENT HOME PAGE
Doc. URL
http: //Content.com/homepage
Content 1, content 2, content 3, content 4,
content 5, Link 1, content 6, content 7,
content 8, content 9, content 10, Link 2,
content 11, content 12, content 13, content 14,
content 15, content 16, Link 3, content 17
http: //Content.com /advertisement

FIG. 4



Title: How to join

URL: http: //auth. com/service/nph-createacct.cgi

1. First name

2. Last name

3. Choose a screen name (no more than 15 characters)

4. Choose a password (no more than 15 characters)

Password:

Re-enter password:

5. E-mail address

6. Your birthdate (MM/DD/YY

7. U.S. zip code, or country code

Zip/postal code:

ISO country code

US

FIG. 5

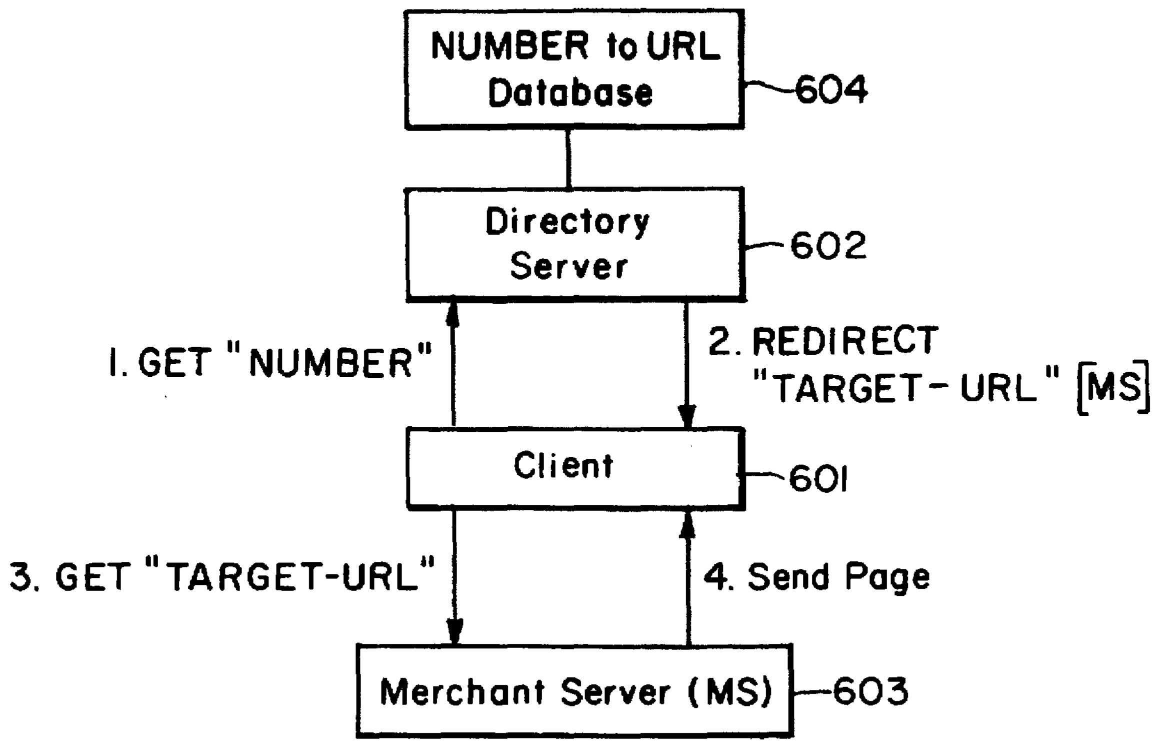

NUMBER to URL Database
604
Directory Server
602
1. GET "NUMBER"
2. REDIRECT "TARGET-URL" [MS]
Client
601
3. GET "TARGET-URL"
4. Send Page
Merchant Server (MS)
603

FIG. 6

INTERNET SERVER ACCESS CONTROL AND MONITORING SYSTEMS

REFERENCE TO APPENDIX

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BACKGROUND OF THE INVENTION

The Internet, which started in the late 1960s, is a vast computer network consisting of many smaller networks that span the entire globe. The Internet has grown exponentially, and millions of users ranging from individuals to corporations now use permanent and dial-up connections to use the Internet on a daily basis worldwide. The computers or networks of computers connected within the Internet, known as "hosts", allow public access to databases featuring information in nearly every field of expertise and are supported by entities ranging from universities and government to many commercial organizations.

The information on the Internet is made available to the public through "servers". A server is a system running on an Internet host for making available files or documents contained within that host. Such files are typically stored on magnetic storage devices, such as tape drives or fixed disks, local to the host. An Internet server may distribute information to any computer that requests the files on a host. The computer making such a request is known as the "client", which may be an Internet-connected workstation, bulletin board system or home personal computer (PC).

TCP/IP (Transmission Control Protocol/Internet Protocol) is one networking protocol that permits full use of the Internet. All computers on a TCP/IP network need unique ID codes. Therefore, each computer or host on the Internet is identified by a unique number code, known as the IP (Internet Protocol) number or address, and corresponding network and computer names. In the past, an Internet user gained access to its resources only by identifying the host computer and a path through directories within the host's storage to locate a requested file. Although various navigating tools have helped users to search resources on the Internet without knowing specific host addresses, these tools still require a substantial technical knowledge of the Internet.

The World-Wide Web (Web) is a method of accessing information on the Internet which allows a user to navigate the Internet resources intuitively, without IP addresses or other technical knowledge. The Web dispenses with command-line utilities which typically require a user to transmit sets of commands to communicate with an Internet server. Instead, the Web is made up of hundreds of thousands of interconnected "pages", or documents, which can be displayed on a computer monitor. The Web pages are provided by hosts running special servers. Software which runs these Web servers is relatively simple and is available on a wide range of computer platforms including PC's. Equally available is a form of client software, known as a Web "browser", which is used to display Web pages as well as traditional non-Web files on the client system. Today, the Internet hosts which provide Web servers are increasing at a rate of more than 300 per month, en route to becoming the preferred method of Internet communication.

Created in 1991, the Web is based on the concept of "hypertext" and a transfer method known as "HTTP" (Hypertext Transfer Protocol). HTTP is designed to run primarily over TCP/IP and uses the standard Internet setup, where a server issues the data and a client displays or processes it. One format for information transfer is to create documents using Hypertext Markup Language (HTML). HTML pages are made up of standard text as well as formatting codes which indicate how the page should be displayed. The Web client, a browser, reads these codes in order to display the page. The hypertext conventions and related functions of the world wide web are described in the appendices of U.S. patent application Ser. No. 08/328,133, filed on Oct. 24, 1994, by Payne et al. which is incorporated herein by reference.

Each Web page may contain pictures and sounds in addition to text. Hidden behind certain text, pictures or sounds are connections, known as "hypertext links" ("links"), to other pages within the same server or even on other computers within the Internet. For example, links may be visually displayed as words or phrases that may be underlined or displayed in a second color. Each link is directed to a web page by using a special name called a URL (Uniform Resource Locator). URLs enable a Web browser to go directly to any file held on any Web server. A user may also specify a known URL by writing it directly into the command line on a Web page to jump to another Web page.

The URL naming system consists of three parts: the transfer format, the host name of the machine that holds the file, and the path to the file. An example of a URL may be:

http://www.college.univ.edu/Adir/Bdir/Cdir/page.html,

where "http" represents the transfer protocol; a colon and two forward slashes (://) are used to separate the transfer format from the host name; "www.college.univ.edu" is the host name in which "www" denotes that the file being requested is a Web page; "/Adir/Bdir/Cdir" is a set of directory names in a tree structure, or a path, on the host machine; and "page.html" is the file name with an indication that the file is written in HTML.

The Internet maintains an open structure in which exchanges of information are made cost-free without restriction. The free access format inherent to the Internet, however, presents difficulties for those information providers requiring control over their Internet servers. Consider for example, a research organization that may want to make certain technical information available on its Internet server to a large group of colleagues around the globe, but the information must be kept confidential. Without means for identifying each client, the organization would not be able to provide information on the network on a confidential or preferential basis. In another situation, a company may want to provide highly specific service tips over its Internet server only to customers having service contracts or accounts.

Access control by an Internet server is difficult for at least two reasons. First, when a client sends a request for a file on a remote Internet server, that message is routed or relayed by a web of computers connected through the Internet until it reaches its destination host. The client does not necessarily know how its message reaches the server. At the same time, the server makes responses without ever knowing exactly who the client is or what its IP address is. While the server may be programmed to trace its clients, the task of tracing is often difficult, if not impossible. Secondly, to prevent unwanted intrusion into private local area networks (LAN), system administrators implement various data-flow control mechanisms, such as the Internet "firewalls", within their networks. An Internet firewall allows a user to reach the Internet anonymously while preventing intruders of the outside world from accessing the user's LAN.

SUMMARY OF THE INVENTION

The present invention relates to methods of processing service requests from a client to a server through a network. In particular the present invention is applicable to processing client requests in an HTTP (Hypertext Transfer Protocol) environment, such as the World-Wide Web (Web). One aspect of the invention involves forwarding a service request from the client to the server and appending a session identification (SID) to the request and to subsequent service requests from the client to the server within a session of requests. In a preferred embodiment, the present method involves returning the SID from the server to the client upon an initial service request made by the client. A valid SID may include an authorization identifier to allow a user to access controlled files.

In a preferred embodiment, a client request is made with a Uniform Resource Locator (URL) from a Web browser. Where a client request is directed to a controlled file without an SID, the Internet server subjects the client to an authorization routine prior to issuing the SID, the SID being protected from forgery. A content server initiates the authorization routine by redirecting the client's request to an authentication server which may be at a different host. Upon receiving a redirected request, the authentication server returns a response to interrogate the client and then issues an SID to a qualified client. For a new client, the authentication server may open a new account and issue an SID thereafter. A valid SID typically comprises a user identifier, an accessible domain, a key identifier, an expiration time such as date, the IP address of the user computer, and an unforgettable digital signature such as a cryptographic hash of all of the other items in the SID encrypted with a secret key. The authentication server then forwards a new request consisting of the original URL appended by the SID to the client in a REDIRECT. The modified request formed by a new URL is automatically forwarded by the client browser to the content server.

When the content server receives a URL request accompanied by an SID, it logs the URL with the SID and the user IP address in a transaction log and proceeds to validate the SID. When the SID is so validated, the content server sends the requested document for display by the client's Web browser.

In the preferred embodiment, a valid SID allows the client to access all controlled files within a protection domain without requiring further authorization. A protection domain is defined by the service provider and is a collection of controlled files of common protection within one or more servers.

When a client accesses a controlled Web page with a valid SID, the user viewing the page may want to traverse a link to view another Web page. There are several possibilities. The user may traverse a link to another page in the same path. This is called a "relative link". A relative link may be made either within the same domain or to a different domain. The browser on the client computer executes a relative link by rewriting the current URL to replace the old controlled page name with a new one. The new URL retains all portions of the old, including the SID, except for the new page name. If the relative link points to a page in the same protection domain, the SID remains valid, and the request is honored.

However, if the relative link points to a controlled page in a different protection domain, the SID is no longer valid, and the client is automatically redirected to forward the rewritten URL to the authentication server to update the SID. The updated or new SID provides access to the new domain if the user is qualified.

The user may also elect to traverse a link to a document in a different path. This is called an "absolute link". In generating a new absolute link, the SID is overwritten by the browser. In the preferred embodiment, the content server, in each serving of a controlled Web page within the domain, filters the page to include the current SID in each absolute URL on the page. Hence, when the user elects to traverse an absolute link, the browser is facilitated with an authenticated URL which is directed with its SID to a page in a different path. In another embodiment, the content server may forego the filtering procedure as above-described and redirect an absolute URL to the authentication server for an update.

An absolute link may also be directed to a controlled file in a different domain. Again, such a request is redirected to the authentication server for processing of a new SID. An absolute link directed to an uncontrolled file is accorded an immediate access.

In another embodiment, a server access control may be maintained by programming the client browser to store an SID or a similar tag for use in each URL call to that particular server. This embodiment, however, requires a special browser which can handle such communications and is generally not suitable for the standard browser format common to the Web.

Another aspect of the invention is to monitor the frequency and duration of access to various pages both controlled and uncontrolled. A transaction log within a content server keeps a history of each client access to a page including the link sequence through which the page was accessed. Additionally, the content server may count the client requests exclusive of repeated requests from a common client. Such records provide important marketing feedback including user demand, access pattern, and relationships between customer demographics and accessed pages and access patterns.

The above and other features of the invention including various novel details of construction and combinations of parts will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular devices and methods embodying the invention are shown by way of illustration only and not as limitations of the invention. The principles and features of this invention may be employed in varied and numerous embodiments without departing from the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram illustrating the Internet operation.

FIG. 2A is a flowchart describing the preferred method of Internet server access control and monitoring.

FIG. 2B is a related flowchart describing the details of the authentication process.

FIG. 3 illustrates an example of a client-server exchange session involving the access control and monitoring method of the present invention.

FIG. 4 is an example of a World Wide Web page.

FIG. 5 is an example of an authorization form page.

FIG. 6 is a diagram describing the details of the translation of telephone numbers to URLs.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, FIG. 1 is a graphical illustration of the Internet. The Internet **10** is a network of millions of interconnected computers **12** including systems owned by Internet providers **16** and information systems (BBS) **20** such as Compuserve or America Online. Individual or corporate users may establish connections to the Internet in several ways. A user on a home PC **14** may purchase an account through the Internet provider **16**. Using a modem **22**, the PC user can dial up the Internet provider to connect to a high speed modem **24** which, in turn, provides a full service connection to the Internet. A user **18** may also make a somewhat limited connection to the Internet through a BBS **20** that provides an Internet gateway connection to its customers.

FIG. 2A is a flowchart detailing the preferred process of the present invention and FIG. **4** illustrates a sample Web page displayed at a client by a browser. The page includes text **404** which includes underlined link text **412**. The title bar **408** and URL bar **402** display the title and URL of the current web page, respectively. As shown in FIG. **4**, the title of the page is "Content Home Page" and the corresponding URL is "http://content.com/homepage". When a cursor **414** is positioned over link text **412*b***, the page which would be retrieved by clicking a mouse is typically identified in a status bar **406** which shows the URL for that link. In this example the status bar **406** shows that the URL for the pointed link **412*b*** is directed to a page called "advertisement", in a commercial content server called "content". By clicking on the link text, the user causes the browser to generate a URL GET request at **100** in FIG. 2A. The browser forwards the request to a content server **120**, which processes the request by first determining whether the requested page is a controlled document **102**. If the request is directed to an uncontrolled page, as in "advertisement" page in this example, the content server records the URL and the IP address, to the extent it is available, in the transaction log **114**. The content server then sends the requested page to the browser **116** for display on the user computer **117**.

If the request is directed to a controlled page, the content server determines whether the URL contains an SID **102**. For example, a URL may be directed to a controlled page name "report", such as "http://content.com/report", that requires an SID. If no SID is present, as in this example, the content server sends a "REDIRECT" response **122** to the browser **100** to redirect the user's initial request to an authentication server **200** to obtain a valid SID. The details of the authentication process are described in FIG. 2B and will be discussed later, but the result of the process is an SID provided from the authentication server to the client. In the above example, a modified URL appended with an SID may be: "http://content.com/[SID]/report". The preferred SID is a sixteen character ASCII string that encodes 96 bits of SID data, 6 bits per character. It contains a 32-bit digital signature, a 16-bit expiration date with a granularity of one hour, a 2-bit key identifier used for key management, an 8-bit domain comprising a set of information files to which the current SID authorizes access, and a 22-bit user identifier. The remaining bits are reserved for expansion. The digital signature is a cryptographic hash of the remaining items in the SID and the authorized IP address which are encrypted with a secret key which is shared by the authentication and content servers.

If the initial GET URL contains a SID, the content server determines whether the request is directed to a page within the current domain **106**. If the request having a SID is directed to a controlled page of a different domain, the SID is no longer valid and, again, the user is redirected to the authentication server **122**.

If the request is for a controlled page within the current domain, the content server proceeds to log the request URL, tagged with SID, and the user IP address in the transaction log **108**. The content server then validates the SID **110**. Such validation includes the following list of checks: (1) the SID's digital signature is compared against the digital signature computed from the remaining items in the SID and the user IP address using the secret key shared by the authentication and content servers; (2) the domain field of the SID is checked to verify that it is within the domain authorized; and (3) the EXP field of the SID is checked to verify that it is later than the current time.

If the validation passes, the content server searches the page to be forwarded for any absolute URL links contained therein **112**, that is, any links directed to controlled documents in different content servers. The content server augments each absolute URL with the current SID to facilitate authenticated accesses across multiple content servers. The requested page as processed is then transmitted to the client browser for display **117**. The user viewing the requested Web page may elect to traverse any link on that page to trigger the entire sequence again **100**.

FIG. **2B** describes the details of the authentication process. The content server may redirect the client to an authentication server. The REDIRECT URL might be: "http://auth.com/authenticate?domain=[domain]&URL=http://content.com/report". That URL requests authentication and specifies the domain and the initial URL. In response to the REDIRECT, the client browser automatically sends a GET request with the provided URL.

Whenever the content server redirects the client to the authentication server **200**, the authentication server initiates the authorization process by validating that it is for an approved content server and determining the level of authentication required for the access requested **210**. Depending on this level, the server may challenge the user **212** for credentials. If the request is for a low level document, the authentication may issue an appropriate SID immediately **228** and forego the credential check procedures. If the document requires credentials, the authentication server sends a "CHALLENGE" response which causes the client browser to prompt the user for credentials **214**. A preferred credential query typically consists of a request for user name and password. If the user is unable to provide a password, the access is denied. The browser forms an authorization header **300** from the information provided, and resends a GET request to the authentication server using the last URL along with an authorization header. For example, a URL of such a GET request may be: "http://auth.com/authenticate?domain=[domain]&URL=http://content.com/report and the authorization header may be:"AUTHORIZE: [authorization]".

Upon receiving the GET request, the authentication server queries an account database **216** to determine whether the user is authorized **218** to access the requested document. A preferred account database may contain a user profile which includes information for identifying purposes, such as client IP address and password, as well as user demographic information, such as user age, home address, hobby, or occupation, for later use by the content server. If the user is authorized, an SID is generated **228** as previously described. If the user is not cleared for authorization, the authentication server checks to see if the user qualifies for a new account **220**. If the user is not qualified to open a new account, a page denying access **222** is transmitted to the client browser **100**. If the user is qualified, the new user is sent a form page such as illustrated in FIG. **5** to initiate a real-time on-line registration **224**. The form may, for example, require personal information and credit references from the user. The browser is able to transmit the data entered by the user in the blanks **502** as a "POST" message to the authentication server. A POST message causes form contents to be sent to the server in a data body other than as part of the URL. If the registration form filled out by the new user is valid **226**, an appropriate SID is generated **228**. If the registration is not valid, access is again denied **222**.

An SID for an authorized user is appended ("tagged") **230** to the original URL directed to a controlled page on the content server. The authentication server then transmits a REDIRECT response **232** based on the tagged URL to the client browser **100**. The modified URL, such as "http://content.com/[SID]/report" is automatically forwarded to the content server **120**.

FIG. **3**, illustrates a typical client-server exchange involving the access control and monitoring method of the present invention. In Step **1**, the client **50** running a browser transmits a GET request through a network for an uncontrolled page (UCP). For example, the user may request an advertisement page by transmitting a URL "http://content.com/advertisement", where "content.com" is the server name and "advertisement" is the uncontrolled page name. In Step **2**, the content server **52** processes the GET request and transmits the requested page, "advertisement". The content server also logs the GET request in the transaction database **56** by recording the URL, the client IP address, and the current time.

In Step **3**, the user on the client machine may elect to traverse a link in the advertisement page directed to a controlled page (CP). For example, the advertisement page may contain a link to a controlled page called "report". Selecting this link causes the client browser **50** to forward a GET request through a URL which is associated with the report file "http://content.com/report". The content server **52** determines that the request is to a controlled page and that the URL does not contain an SID. In Step **4**, the content server transmits a REDIRECT response to the client, and, in Step **5**, the browser automatically sends the REDIRECT URL to the authentication server **54**. The REDIRECT URL sent to the authentication server may contain the following string:

"http://auth.com/authenticate?domain=[domain]&URL=http://content.com/report".

The authentication server processes the REDIRECT and determines whether user credentials (CRED) are needed for authorization. In Step **6**, the authentication server transmits a "CHALLENGE" response to the client. As previously described, typical credentials consist of user name and password. An authorization header based on the credential information is then forwarded by the client browser to the authentication server. For example, a GET URL having such an authorization header is:

"http://autho.com/authenticate?domain=[domain]&URL=http://content.com/report and the authorization header may be: "AUTHORIZE:[authorization]". The authentication server processes the GET request by checking the Account Database **58**. If a valid account exists for the user, an SID is issued which authorizes access to the controlled page "report" and all the other pages within the domain.

As previously described, the preferred SID comprises a compact ASCII string that encodes a user identifier, the current domain, a key identifier, an expiration time, the client IP address, and an unforgeable digital signature. In Step **8**, the authentication server redirects the client to the tagged URL, "http://content.com/[SID]/report", to the client. In Step **9**, the tagged URL is automatically forwarded by the browser as a GET request to the content server. The content server logs the GET request in the Transaction database **56** by recording the tagged URL, the client IP address, and the current time. In Step **10**, the content server, upon validating the SID, transmits the requested controlled page "report" for display on the client browser.

According to one aspect of the present invention, the content server periodically evaluates the record contained in the transaction log **56** to determine the frequency and duration of accesses to the associated content server. The server counts requests to particular pages exclusive of repeated requests from a common client in order to determine the merits of the information on different pages for ratings purposes. By excluding repeated calls, the system avoids distortions by users attempting to "stuff the ballot box." In one embodiment, the time intervals between repeated requests by a common client are measured to exclude those requests falling within a defined period of time.

Additionally, the server may, at any given time, track access history within a client-server session. Such a history profile informs the service provider about link transversal frequencies and link paths followed by users. This profile is produced by filtering transaction logs from one or more servers to select only transactions involving a particular user ID (UID). Two subsequent entries, A and B, corresponding to requests from a given user in these logs represent a link traversal from document A to document B made by the user in question. This information may be used to identify the most popular links to a specific page and to suggest where to insert new links to provide more direct access. In another embodiment, the access history is evaluated to determine traversed links leading to a purchase of a product made within commercial pages. This information may be used, for example, to charge for advertising based on the number of link traversals from an advertising page to a product page or based on the count of purchases resulting from a path including the advertisement. In this embodiment, the server can gauge the effectiveness of advertising by measuring the number of sales that resulted from a particular page, link, or path of links. The system can be configured to charge the merchant for an advertising page based on the number of sales that resulted from that page.

According to another aspect of the present invention, a secondary server, such as the authentication server **200** in FIG. **2B**, may access a prearranged user profile from the account database **216** and include information based on such a profile in the user identifier field of the SID. In a preferred embodiment, the content server may use such an SID to customize user requested pages to include personalized content based on the user identifier field of the SID.

In another aspect of the invention, the user may gain access to domain of servers containing journals or publications through a subscription. In such a situation, the user may purchase the subscription in advance to gain access to on-line documents through the Internet. The user gains access to a subscribed document over the Internet through the authorization procedure as described above where an authorization indicator is preferably embedded in a session identifier. In another embodiment, rather than relying on a prepaid subscription, a user may be charged and billed each time he or she accesses a particular document through the Internet. In that case, authorization may not be required so long as the user is fully identified in order to be charged for the service. The user identification is most appropriately embedded in the session identifier described above.

In another aspect of the invention, facilities are provided to allow users to utilize conventional telephone numbers or other identifiers to access merchant services. These merchant services can optionally be protected using SIDs. In a preferred embodiment, as shown in FIG. 6, a Web browser client **601** provides a "dial" command to accept a telephone number from a user, as by clicking on a "dial" icon and inputting the telephone number through the keyboard. The browser then constructs a URL of the form "http://directory.net/NUMBER", where NUMBER is the telephone number or other identifier specified by the user. The browser then performs a GET of the document specified by this URL, and contacts directory server **602**, sending the NUMBER requested in Message **1**.

In another embodiment, implemented with a conventional browser, client **601** uses a form page provided by directory server **602** that prompts for a telephone number or other identifier in place of a "dial" command, and Message **1** is a POST message to a URL specified by this form page.

Once NUMBER is received by directory server **602**, the directory server uses database **604** to translate the NUMBER to a target URL that describes the merchant server and document that implements the service corresponding to NUMBER. This translation can ignore the punctuation of the number, therefore embedded parenthesis or dashes are not significant.

In another embodiment an identifier other than a number may be provided. For example, a user may enter a company name or product name without exact spelling. In such a case a "soundex" or other phonetic mapping can be used to permit words that sound alike to map to the same target URL. Multiple identifiers can also be used, such as a telephone number in conjunction with a product name or extension.

In Message **2**, Directory server **602** sends a REDIRECT to client **601**, specifying the target URL for NUMBER as computed from database **604**. The client browser **601** then automatically sends Message **3** to GET the contents of this URL. Merchant server **603** returns this information in Message **4**. The server **602** might have returned a Web page to the client to provide an appropriate link to the required document. However, because server **602** makes a translation to a final URL and sends a REDIRECT rather than a page to client **601**, the document of message **4** is obtained without any user action beyond the initial dial input.

The Target URL contained in Message **3** can be an ordinary URL to an uncontrolled page, or it can be a URL that describes a controlled page. If the Target URL describes a controlled page then authentication is performed as previously described. The Target URL can also describe a URL that includes an SID that provides a preauthorized means of accessing a controlled page.

Among benefits of the "dial" command and its implementation is an improved way of accessing the Internet that is compatible with conventional telephone numbers and other identifiers. Merchants do not need to alter their print or television advertising to provide an Internet specific form of contact information, and users do not need to learn about URLs.

In the approach a single merchant server can provide multiple services that correspond to different external "telephone numbers" or other identifiers. For example, if users dial the "flight arrival" number they could be directed to the URL for the arrival page, while, if they dial the "reservations" number, they would be directed to the URL for the reservations page. A "priority gold" number could be directed to a controlled page URL that would first authenticate the user as belonging to the gold users group, and then would provide access to the "priority gold" page. An unpublished "ambassador" number could be directed to a tagged URL that permits access to the "priority gold" page without user authentication.

Equivalents

Those skilled in the art will know, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments or the invention described herein. These and all other equivalents are intended to be encompassed by the following claims.

```
/
 * tclSidSup.c --
 *
 *      tcl SID pack/unpack/id routines
 *
 *  Steve Morris
 *  morris@openmarket.com
 */

/* #define debug 1 */

#include <stdio.h>
#include <sys/types.h>
#include <stdlib.h>
#include <unistd.h>
#ifdef __alpha
#include <sys/time.h>
#endif
#include <tcl.h>
#include "global.h"
#include "md5.h"



#ifdef debug
#define dbg_out(s) printf("%s\n", s);
#define dbg_outi(s,a) printf("%s %x\n", s,a);
#define dbg_outs(s,a) printf("%s %s\n", s,a);
#else
#define dbg_out(s)
#define dbg_outi(s,a)
#define dbg_outs(s,a)
#endif


/* external routines called
*/
      char * radix64decode_noslash(char *in, int len, int *output_len);
      char * radix64encode_noslash(char *in, int len);
      int compute_ihash(char *str);


#define       sid_rev_zero (0)


#define get_sid(lw,pos,mask) ((bsid[lw]>>pos) & mask)
#define put_sid(lw,pos,mask,data) {bsid[lw] &= ~(0xffffffff & (mask<<pos)); \
                                   bsid[lw] |= ((data & mask)<<pos); }

#define sig_lw     0
#define sig_pos    0
#define sig_mask   0xffffffff

#define kid_lw     1
#define kid_pos    0
#define kid_mask   0x3
#define rev_lw     1
#define rev_pos    2
#define rev_mask   0x3
#define uid_lw     1
```

2

```
#define uid_pos     4
#define uid_mask    0x3fffff
#define rsrv1_lw    1
#define rsrv1_pos   26
#define rsrv1_mask 0x3f

#define dom_lw      2
#define dom_pos     0
#define dom_mask    0xff
#define rsrv2_lw    2
#define rsrv2_pos   8
#define rsrv2_mask 0x3f
#define uctx_lw     2
#define uctx_pos    14
#define uctx_mask   0x3
#define exp_lw      2
#define exp_pos     16
#define exp_mask    0xffff


#ifdef __sun__
#define fix_endian(i,o)    {  ecp = (char *) i; \
                              eda  =  (*ecp++)<<0; \
                              eda  |= (*ecp++)<<8; \
                              eda  |= (*ecp++)<<16; \
                              eda  |= (*ecp)<<24; \
                              (int *) *o = eda;}
#else
/* #define fix_endian(i,o)    { (int *) *o = (int *) *i;} */
#define fix_endian(i,o)
#endif
```

```
/* TclUnpackSid[NoValidate]
 *    Converts a binary sid to the internal representation, and does minimal
 *    validation on the SID, the NoValidate version does even less.
 * Inputs:
 *    the sid           a sid, looks like "/@@u9GIg4QEAAAAABPn"
 * Returns:
 *    {%d %d %d %d}    on succes (dom uid keyid exp)
 * or ""               on failure
 *
 */



int TclUnpackSid(ClientData dummy, Tcl_Interp *interp,
                         int argc, char **argv)
    {

    char temp[512];
    int ret_status = 1;
    int i;
    int * bsid = NULL, act_hash;
    char ip_address[32]="", secret[200]="", *cp;
    unsigned char *ecp;
    unsigned int eda;
    char hash_buffer[512];

    struct sid_info
      {
      unsigned int sig;
      unsigned int kid;
      unsigned int uid;
      unsigned int rev;
      unsigned int dom;
      unsigned int exp;
      unsigned int uctx;
      } esid;

    if (argc != 2)
      {
      Tcl_AppendResult(interp, "wrong # args: should be \"", argv[0],
        " string\"", (char *) NULL);
      return TCL_ERROR;
      }

#ifdef test_ip
    strcpy(ip_address, test_ip);
#endif
#ifdef test_secret
    strcpy(secret, test_secret);
#endif

      cp = Tcl_GetVar(interp, "sidip", TCL_GLOBAL_ONLY|TCL_LEAVE_ERR_MSG);
      if (cp != NULL) strncpy(ip_address, cp, 31);

      cp = argv[1]+3;
      i = strlen(cp);
      if (i != 16) goto sid_bad;
```

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```
/* first convert the SID back to binary*/
bsid = (int *) radix64decode_noslash(cp, i, &i);
if (bsid == NULL) goto sid_bad;
if (i != 12) goto sid_bad;

fix_endian(&bsid[0], &bsid[0]);
fix_endian(&bsid[1], &bsid[1]);
fix_endian(&bsid[2], &bsid[2]);

dbg_outi("sid[0]=",bsid[0]);
dbg_outi("sid[1]=",bsid[1]);
dbg_outi("sid[2]=",bsid[2]);

dbg_outi("sig =",get_sid(sig_lw,sig_pos,sig_mask));
dbg_outi("kid =",get_sid(kid_lw,kid_pos,kid_mask));
dbg_outi("uid =",get_sid(uid_lw,uid_pos,uid_mask));
dbg_outi("rev =",get_sid(rev_lw,rev_pos,rev_mask));
dbg_outi("dom =",get_sid(dom_lw,dom_pos,dom_mask));
dbg_outi("exp =",get_sid(exp_lw,exp_pos,exp_mask));
dbg_outi("uctx =",get_sid(uctx_lw,uctx_pos,uctx_mask));
dbg_outi("rs1 =",get_sid(rsrv1_lw,rsrv1_pos,rsrv1_mask));
dbg_outi("rs2 =",get_sid(rsrv2_lw,rsrv2_pos,rsrv2_mask));


/* check the SID version field */
if (get_sid(rev_lw,rev_pos,rev_mask) != sid_rev_zero) goto sid_bad;
if (get_sid(rsrv1_lw,rsrv1_pos,rsrv1_mask) != 0) goto sid_bad;
if (get_sid(rsrv2_lw,rsrv2_pos,rsrv2_mask) != 0) goto sid_bad;

/* unpack the sid */
esid.sig = get_sid(sig_lw,sig_pos,sig_mask);
esid.kid = get_sid(kid_lw,kid_pos,kid_mask);
esid.uid = get_sid(uid_lw,uid_pos,uid_mask);
esid.rev = get_sid(rev_lw,rev_pos,rev_mask);
esid.dom = get_sid(dom_lw,dom_pos,dom_mask);
esid.exp = get_sid(exp_lw,exp_pos,exp_mask);
esid.uctx = get_sid(uctx_lw,uctx_pos,uctx_mask);

dbg_outi("sig =",esid.sig);
dbg_outi("kid =",esid.kid);
dbg_outi("uid =",esid.uid);
dbg_outi("rev =",esid.rev);
dbg_outi("dom =",esid.dom);
dbg_outi("exp =",esid.exp);
dbg_outi("uctx =",esid.uctx);

sprintf(temp,"secret(%d)",esid.kid);
cp = Tcl_GetVar(interp, temp, TCL_GLOBAL_ONLY);
if (cp != NULL) strncpy(secret, cp, 199);

/* hash the sid and check the signature */
sprintf(hash_buffer, "%s%s%08x%08x", secret,ip_address,bsid[2],bsid[1]);
dbg_outs("hashing ->",hash_buffer);
act_hash = compute_ihash(hash_buffer);
fix_endian(&act_hash, &act_hash);
dbg_outi("expected hash=",bsid[0]);
dbg_outi("actual   hash=",act_hash);
if (act_hash != esid.sig) goto  sid_bad;

rtn_exit:
      if (bsid != NULL) free(bsid);
      if (ret_status) sprintf(interp->result,"{%d %d %d %d %d}",
          esid.dom,esid.uid,esid.kid,esid.exp,esid.uctx);
      else sprintf(interp->result,"");
      return TCL_OK;

    sid_bad:
      ret_status = 0;
      goto rtn_exit;

   exp_bad:
      ret_status = 0;
      goto rtn_exit;

}
```

```
int TclUnpackSidNoValidate(ClientData dummy, Tcl_Interp *interp,
                        int argc, char **argv)
    {

    char temp[512];
    int ret_status = 1;
    int i;
    int * bsid = NULL, act_hash;
    char ip_address[32]="", secret[200]="", *cp;
    unsigned char *ecp;
    unsigned int eda;
    char hash_buffer[512];

    struct sid_info
      {
      unsigned int sig;
      unsigned int kid;
      unsigned int uid;
      unsigned int rev;
      unsigned int dom;
      unsigned int exp;
      unsigned int uctx;
      } esid;

    if (argc != 2)
      {
      Tcl_AppendResult(interp, "wrong # args: should be \"", argv[0],
        " string\"", (char *) NULL);
      return TCL_ERROR;
      }

#ifdef test_ip
    strcpy(ip_address, test_ip);
#endif
#ifdef test_secret
    strcpy(secret, test_secret);
#endif

      cp = Tcl_GetVar(interp, "sidip", TCL_GLOBAL_ONLY|TCL_LEAVE_ERR_MSG);
      if (cp != NULL) strncpy(ip_address, cp, 31);

      cp = argv[1]+3;
      i = strlen(cp);
      if (i != 16) goto sid_bad;

      /* first convert the SID back to binary*/
      bsid = (int *) radix64decode_noslash(cp, i, &i);
      if (bsid == NULL) goto sid_bad;
      if (i != 12) goto sid_bad;

      fix_endian(&bsid[0], &bsid[0]);
      fix_endian(&bsid[1], &bsid[1]);
      fix_endian(&bsid[2], &bsid[2]);

      dbg_outi("sid[0]=",bsid[0]);
      dbg_outi("sid[1]=",bsid[1]);
      dbg_outi("sid[2]=",bsid[2]);

      dbg_outi("sig =",get_sid(sig_lw,sig_pos,sig_mask));
```

```
        dbg_outi("kid =",get_sid(kid_lw,kid_pos,kid_mask));
        dbg_outi("uid =",get_sid(uid_lw,uid_pos,uid_mask));
        dbg_outi("rev =",get_sid(rev_lw,rev_pos,rev_mask));
        dbg_outi("dom =",get_sid(dom_lw,dom_pos,dom_mask));
        dbg_outi("exp =",get_sid(exp_lw,exp_pos,exp_mask));
        dbg_outi("uctx =",get_sid(uctx_lw,uctx_pos,uctx_mask));
        dbg_outi("rs1 =",get_sid(rsrv1_lw,rsrv1_pos,rsrv1_mask));
        dbg_outi("rs2 =",get_sid(rsrv2_lw,rsrv2_pos,rsrv2_mask));


        /* check the SID version field */
        if (get_sid(rev_lw,rev_pos,rev_mask) != sid_rev_zero) goto sid_bad;
        if (get_sid(rsrv1_lw,rsrv1_pos,rsrv1_mask) != 0) goto sid_bad;
        if (get_sid(rsrv2_lw,rsrv2_pos,rsrv2_mask) != 0) goto sid_bad;

        /* unpack the sid */
        esid.sig = get_sid(sig_lw,sig_pos,sig_mask);
        esid.kid = get_sid(kid_lw,kid_pos,kid_mask);
        esid.uid = get_sid(uid_lw,uid_pos,uid_mask);
        esid.rev = get_sid(rev_lw,rev_pos,rev_mask);
        esid.dom = get_sid(dom_lw,dom_pos,dom_mask);
        esid.exp = get_sid(exp_lw,exp_pos,exp_mask);
        esid.uctx = get_sid(uctx_lw,uctx_pos,uctx_mask);

        dbg_outi("sig =",esid.sig);
        dbg_outi("kid =",esid.kid);
        dbg_outi("uid =",esid.uid);
        dbg_outi("rev =",esid.rev);
        dbg_outi("dom =",esid.dom);
        dbg_outi("exp =",esid.exp);
        dbg_outi("uctx =",esid.uctx);

#if (1 == 0) /* disable validation for the novalidate case */
        sprintf(temp,"secret(%d)",esid.kid);
        cp = Tcl_GetVar(interp, temp, TCL_GLOBAL_ONLY);
        if (cp != NULL) strncpy(secret, cp, 199);

       /* hash the sid and check the signature */
       sprintf(hash_buffer, "%s%s%08x%08x", secret,ip_address,bsid[2],bsid[1]);
       dbg_outs("hashing ->",hash_buffer);
       act_hash = compute_ihash(hash_buffer);
       fix_endian(&act_hash, &act_hash);
       dbg_outi("expected hash=",bsid[0]);
       dbg_outi("actual   hash=",act_hash);
       if (act_hash != esid.sig) goto  sid_bad;
#endif

     rtn_exit:
        if (bsid != NULL) free(bsid);
        if (ret_status) sprintf(interp->result,"{%d %d %d %d %d}",
            esid.dom,esid.uid,esid.kid,esid.exp, esid.uctx);
       else sprintf(interp->result,"");
       return TCL_OK;


     sid_bad:
       ret_status = 0;
       goto rtn_exit;

   exp_bad:
        ret_status = 0;
        goto rtn_exit;

}
```

```
/* TclPackSid
 *    Creates the ascii representation of a binary sid
 * Inputs:
 *    "{%d %d %d %d [%d]}  Dom uid keyid exp [uctx]
 * Returns:
 *    ascii bin_sid like  "/@@u9GIg4QEAAAAABPn"
 *
 */


int TclPackSid(ClientData dummy, Tcl_Interp *interp,
                        int argc, char **argv)
    {
    char temp[512];
    int bsid[3] = {0,0,0}, i, act_hash;
    unsigned char *ecp;
    unsigned int eda;

    char ip_address[32], secret[200]="", *cp;
    int dom, uid, keyid, exp, uctx;
    char hash_buffer[512];

    struct sid_info
      {
      unsigned int sig;
      unsigned int kid;
      unsigned int uid;
      unsigned int rev;
      unsigned int dom;
      unsigned int exp;
      unsigned int uctx;
      } esid;

    if (argc != 2)
      {
      Tcl_AppendResult(interp, "wrong # args: should be \"", argv[0],
        " string\"", (char *) NULL);
      return TCL_ERROR;
      }


     i = sscanf(argv[1],"%d %d %d %d %d", &dom, &uid, &keyid, &exp, &uctx);
     dbg_outs("scanning...",argv[1]);
     dbg_outi("scan returned ",i);
     if (i == 4) {uctx = 0; i = 5;}
     if (i != 5) return TCL_ERROR;

      esid.kid = keyid;
      esid.uid = uid;
      esid.dom = dom;
      esid.exp = exp;
      esid.uctx = uctx;
      dbg_outi("kid=",esid.kid);
      dbg_outi("uid=",esid.uid);
      dbg_outi("dom=",esid.dom);
      dbg_outi("exp=",esid.exp);
      dbg_outi("uctx=",esid.uctx);
#ifdef test_ip
    strcpy(ip_address, test_ip);
#endif
#ifdef test_secret
    strcpy(secret, test_secret);
#endif
      cp = Tcl_GetVar(interp, "sidip", TCL_GLOBAL_ONLY);
      if (cp != NULL) strncpy(ip_address, cp, 31);


      sprintf(temp,"secret(%d)",esid.kid);
      cp = Tcl_GetVar(interp, temp, TCL_GLOBAL_ONLY);
      if (cp != NULL) strncpy(secret, cp, 199);


      put_sid(kid_lw,   kid_pos,   kid_mask,   esid.kid);
      put_sid(uid_lw,   uid_pos,   uid_mask,   esid.uid);
      put_sid(rsrv1_lw, rsrv1_pos, rsrv1_mask, 0);
      put_sid(rev_lw,   rev_pos,   rev_mask,   sid_rev_zero);
      put_sid(dom_lw,   dom_pos,   dom_mask,   esid.dom);
      put_sid(rsrv2_lw, rsrv2_pos, rsrv2_mask, 0);
      put_sid(exp_lw,   exp_pos,   exp_mask,   esid.exp);
      put_sid(uctx_lw,  uctx_pos,  uctx_mask,  esid.uctx);

      dbg_outi("sid[0]=",bsid[0]);
      dbg_outi("sid[1]=",bsid[1]);
      dbg_outi("sid[2]=",bsid[2]);

      sprintf(hash_buffer, "%s%s%08x%08x", secret,ip_address,bsid[2],bsid[1]);
      dbg_outs("ascii sid built ",hash_buffer);
      act_hash = compute_ihash(hash_buffer);
/*    fix_endian(&act_hash, &act_hash); */
      put_sid(sig_lw, sig_pos, sig_mask, act_hash);

/*    dbg_outi("sid[0]=",bsid[0]);
      dbg_outi("sid[1]=",bsid[1]);
      dbg_outi("sid[2]=",bsid[2]);    */


/*    fix_endian(&bsid[0], &bsid[0]); */
      fix_endian(&bsid[1], &bsid[1]);
      fix_endian(&bsid[2], &bsid[2]);

      dbg_outi("sid[0]=",bsid[0]);
      dbg_outi("sid[1]=",bsid[1]);
      dbg_outi("sid[2]=",bsid[2]);



      cp = radix64encode_noslash((char *) bsid, 12);
      if (cp == NULL) return TCL_ERROR;
      sprintf(temp,"/@@%s", cp);
      Tcl_SetResult(interp, temp, TCL_VOLATILE);
      if (cp != NULL) free(cp);
      return TCL_OK;

}
```

```
/* TclIdSid
 *    Scans an ascii line and finds an ascii SID. (no validation though)
 * Inputs:
 *    lineoftext
 * Returns:
 *    ascii bin_sid, if a sid is found it is returned.
 *
 */


int TclIdSid(ClientData dummy, Tcl_Interp *interp,
                            int argc, char **argv)
    {
    char *sidp, *cp;

    interp->result[0] = 0;


    if (argc != 2)
      {
      interp->result = "wrong # args";
      return TCL_ERROR;
      }
    sidp = (char *) strstr(argv[1], "/@@");
    if (sidp == NULL) return TCL_OK;
    cp = (char *) strstr(sidp+1,"/");
    if ((cp == NULL) && (strlen(sidp) != 19)) return TCL_OK;
    if ((cp - sidp) != 19) return TCL_OK;
    strncpy(interp->result, sidp,19);
    interp->result[19] = 0;
    return TCL_OK;
    }



/*
 * Register commands with interpreter.
 */
int SidSupInit(Tcl_Interp *interp)
  {
  Tcl_CreateCommand(interp, "packsid",   TclPackSid,   NULL, NULL);
  Tcl_CreateCommand(interp, "unpacksid", TclUnpackSid, NULL, NULL);
  Tcl_CreateCommand(interp, "unpacksidnovalidate", TclUnpackSidNoValidate, NULL,
  Tcl_CreateCommand(interp, "issid",     TclIdSid,     NULL, NULL);
  return TCL_OK;
  }
```

```
/*
 *----------------------------------------------------------------------
 *
 * compute_ihash --
 *
 *  Compute the MD5 hash for the specified string, returning the hash as
 *  a 32b xor of the 4 hash longwords.
 *
 * Results:
 *      hash int.
 *
 * Side effects:
 *      None.
 *----------------------------------------------------------------------
 */
int compute_ihash(char *str)
{
    MD5_CTX md5;
    unsigned char hash[16];
    unsigned int *p1;
    unsigned int hashi = 0;

    MD5Init(&md5);
    MD5Update(&md5, str, strlen(str));
    MD5Final(hash, &md5);
    p1 =  (unsigned int *) hash;

    hashi = *p1++;
    hashi ^= *p1++;
    hashi ^= *p1++;
    hashi ^= *p1++;
    return hashi;
}
```

```
/*
 * ticket.c --
 *
 *      Commands for TICKET.
 *
 * Copyright 1995 by Open Market, Inc.
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 *
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 * remains the unpublished property of Open Market, Inc. Use,
 * disclosure, or reproduction is prohibited except as permitted by
 * express written license agreement with Open Market, Inc.
 *
 * Steve Morris
 * morris@OpenMarket.com
 *
 * Created: Wed Mar 1 1995
 * $Source: /omi/proj/master/omhttpd/Attic/ticket.c,v $
 *
 */

#if !defined(lint)
static const char rcsid[]="$Header: /omi/proj/master/omhttpd/Attic/ticket.c,v 2.
#endif /*not lint*/

#include <stdio.h>
#include <sys/utsname.h>
#include "httpd.h"
#include "md5.h"
#include "ticket.h"


static TICKET_Server TicketServerData;
```

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```
/*
 * This file implements all the ticket/sid related functions for the server.
 *
 * The region commands RequireSID and xxxxx can be used to limit
 * access to groups of files based on the authentication of the requestor.
 * The two commands are very similar, and only differ in the method used to
 * present the authentication data (via the URL) and in handling of the
 * failing access case. For failing TICKET's, a "not authorized" message is
 * generated. For failing (or absent) SID's, a REDIRECT (either local or via
 * CGI script) is performed to forward the request to an authentication server.
 *
 * RequireSID domain1 [domain2 ... domainn]
 *
 *      This command denies access unless the specified properties are
 *      true of the request. Only one RequireSID or xxxxx command can
 *      be used for a given region, though it may specify multiple domains.
 *
 *
 */
```

43(a)

```
static int    ProcessRequires(ClientData clientData, Tcl_Interp *interp,
                              int argc, char **argv, int flavor);
static int    DomainNameCmd(ClientData clientData, Tcl_Interp *interp,
                              int argc, char **argv);
static int    GetDomain(char *domname, int dflt);
static char *GetAsciiDomain(char *domname, char *dflt);
static int    compute_ihash(char *str);
static char *computeHash(char *str);
static char *GetSecret(int kid);
static int    GetKidByKeyID(char *keyID);
static char *CreateSid(HTTP_Request *reqPtr, int dom, int uid, int kid,
                          int exp, int uctx);
static void freeTicketReqData(void *dataPtr);
static void DumpStatus(HTTP_Request *reqPtr);
static void TICKET_DebugHooks(ClientData clientData, char *suffix,
                            HTTP_Request *reqPtr);
static int ParseSid(HTTP_Request *reqPtr);
static int ParseTicket(HTTP_Request *reqPtr);
static char *fieldParse(char *str, char sep, char **endptr);
void TICKET_ConfigCheck();
void DumpRusage(HTTP_Request *reqPtr);
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_RequireSidCmd --
 *
 *      Checks that the requested URL is authorized via SID to access this
 *      region. If the access is not authorized and we do not have a "remote
 *      authentication server" registered, then an "unauthorized message"
 *      is returned. If a "remote authentication server" has been
 *      declared, we REDIRECT to that server, passing the requested URL and
 *      required domain's as arguments.
 *
 * Results:
 *      Normal Tcl result, or a REDIRECT request.
 *
 * Side effects:
 *      Either an "unauthorized access" message or a REDIRECT in case of error.
 *
 *----------------------------------------------------------------------
 */
static int TICKET_RequireSidCmd(ClientData clientData, Tcl_Interp *interp,
                             int argc, char **argv)
    {
    if (TicketGlobalData(EnableSidEater)) return TCL_OK;
    return(ProcessRequires(clientData, interp,argc, argv, ticketSid));
    }
```

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```
/*
 *-----------------------------------------------------------------
 *
 * ProcessRequires --
 *
 *      Checks that the requested URL is authorized to access this
 *      region. The error cases are treated differently for SID v.s. TICKET.
 *      For Ticket's, an unauthorized access generates a returned error message.
 *      For SID's, we first look to see if we are operating in "local authentica
 *      mode", if we are, we generate a new SID, into the URL and re-process the
 *      If not in "local" mode, we look for the presence of a remoteauthenticati
 *      server, if we have one declared (in the conf file) we REDIRECT to it pas
 *      the FULL url and a list of domains that would have been legal. If the
 *      authentication server was not found we return an error message.
 *
 * Results:
 *      Normal Tcl result, a local reprocess command, or a REDIRECT request.
 *
 * Side effects:
 *      Either an "unauthorized access" message or a REDIRECT in case of error.
 *
 *-----------------------------------------------------------------
 */
static int ProcessRequires(ClientData clientData, Tcl_Interp *interp,
                           int argc, char **argv, int flavor)
    {

    HTTP_Request *reqPtr = (HTTP_Request *) clientData;
    HTTP_Server  *serverPtr;
    TICKET_Request *ticketPtr;
    DString targetUrl;
    DString escapeUrl;
    int i, required_dom;
    int firstLegalDom = -1;
    char *NewSid, *cp;

    DStringInit(&targetUrl);
    DStringInit(&escapeUrl);

    /* fetch the server private and ticket specific extension data */
    serverPtr = reqPtr->serverPtr;
    ticketPtr = (TICKET_Request *) HT_GetReqExtData(reqPtr, TicketServerData.tic
    ASSERT (ticketPtr != NULL);


    /* compare the requesting SID/Ticket<DOM> to authorized list of domains */
    /* a match OR any valid domain and a required domain of TicketFreeArea is su
   for (i = 1; i < argc; i++)
     {
     required_dom = GetDomain(argv[i],-1);
     if (required_dom != -1)
       {
       if (firstLegalDom == -1) firstLegalDom = required_dom;
       if ( (ticketPtr->sidDom == required_dom) ||
            (ticketPtr->valid && (ticketPtr->sidDom != -1) &&
             (required_dom == TicketGlobalData(FreeArea)) ||
            ((ticketPtr->ticketDom == required_dom) &&
              (time(0) <= ticketPtr->ticketExp) &&
              ((DStringLength(&ticketPtr->ticketIP) == 0) ||
```

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```
            (strcmp(DStringValue(&ticketPtr->ticketIP), DStringValue(&reqPtr->r
        )
          {
          DStringFree(&targetUrl);
          DStringFree(&escapeUrl);
          return TCL_OK;
          }
      }
    }


/* count the number of domain crossing that caused re-auth */
if ((flavor == ticketSid) && (ticketPtr->sidDom) != -1) IncTicketCounter(Cou

/* authorization failed, if this was a sid url, and local auth is enabled */
/* or this was an access to the free area */
/* insert a new sid in the url, and REDIRECT back to the client */
if (TicketGlobalData(EnableLocalAuth) ||
    ((firstLegalDom == TicketGlobalData(FreeArea))
    && (flavor == ticketSid) && (firstLegalDom != -1)))
  {
  if ((DStringLength(&reqPtr->url) != 0) &&
      (DStringValue(&reqPtr->url)[0] != '/'))
    {
    HTTP_Error(reqPtr, NOT_FOUND, "access denied due to poorly formed url");
    DStringFree(&targetUrl);
    DStringFree(&escapeUrl);
    if (!ticketPtr->valid)
      DStringFree(&ticketPtr->sid);
    return TCL_RETURN ;
    }
  NewSid =  CreateSid(reqPtr,
            firstLegalDom, ticketPtr->uid,
            TicketGlobalData(CurrentSecret), TicketGlobalData(LocalAuthExp),
            ticketPtr->uctx);
  DStringFree(&ticketPtr->sid);
  DStringAppend(&ticketPtr->sid, NewSid, -1);
  ComposeURL(reqPtr, DStringValue(&reqPtr->url), &targetUrl);
  IncTicketCounter(CountLocalRedirects);
  HTTP_Error(reqPtr, REDIRECT, DStringValue(&targetUrl));
  DStringFree(&targetUrl);
  DStringFree(&escapeUrl);
  if (!ticketPtr->valid)
    DStringFree(&ticketPtr->sid);
  return TCL_RETURN;
  }


/* authorization failed, build the REDIRECT URL arg's. */
/* If present, REDIRECT to authentication server */
if ((DStringLength(&TicketGlobalData(AuthServer)) != 0) && (flavor == ticket
  {
  if ((DStringLength(&reqPtr->url) != 0) &&
      (DStringValue(&reqPtr->url)[0] != '/'))
    {
    HTTP_Error(reqPtr, NOT_FOUND, "access denied due to poorly formed url");
    DStringFree(&targetUrl);
    DStringFree(&escapeUrl);
    if (!ticketPtr->valid)
      DStringFree(&ticketPtr->sid);
```

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```
    return TCL_RETURN ;
    }
  DStringAppend(&targetUrl, DStringValue(&TicketGlobalData(AuthServer)), -1)
  DStringAppend(&targetUrl, "?url=", -1);
  ComposeURL(reqPtr, DStringValue(&reqPtr->url), &escapeUrl);
  EscapeUrl(&escapeUrl);
  DStringAppend(&targetUrl,DStringValue(&escapeUrl), -1);
  DStringAppend(&targetUrl, "&domain=", -1);
  DStringTrunc(&escapeUrl, 0);
  DStringAppend(&escapeUrl, "{", -1);
  for (i=1; i < argc; i++)
    {
    cp = GetAsciiDomain(argv[i], NULL);
    if (cp != NULL)
      {
      DStringAppend(&escapeUrl, cp, -1);
      DStringAppend(&escapeUrl, " ", -1);
      }
    }
  DStringAppend(&escapeUrl, "}", -1);
  EscapeUrl(&escapeUrl);
  DStringAppend(&targetUrl,DStringValue(&escapeUrl), -1);
  DStringFree(&escapeUrl);
  HTTP_Error(reqPtr, REDIRECT, DStringValue(&targetUrl));
  IncTicketCounter(CountRemoteRedirects);
  DStringFree(&targetUrl);
  if (!ticketPtr->valid)
    DStringFree(&ticketPtr->sid);
  return TCL_RETURN;
  }

/* authorization failed, if this is a ticket access, decode the */
/* reason and handle via a redirect to a handler, or punt a    */
/* no access message */
if ((flavor == ticketTicket) && (firstLegalDom != -1) && (ticketPtr->ticketD
  {
  /* check For IP address restrictions */
  if ((DStringLength(&ticketPtr->ticketIP) != 0) &&
      (DStringLength(&TicketGlobalData(TicketAdrHandler)) != 0) &&
      (strcmp(DStringValue(&ticketPtr->ticketIP), DStringValue(&reqPtr->remo
    {
    DStringAppend(&targetUrl, DStringValue(&TicketGlobalData(TicketAdrHandle
    DStringAppend(&targetUrl, DStringValue(&ticketPtr->fields), -1);
    DStringAppend(&targetUrl, "&url=", -1);
    DStringAppend(&targetUrl, DStringValue(&reqPtr->url), -1);
    IncTicketCounter(CountTicketAddr);
    HTTP_Error(reqPtr, REDIRECT, DStringValue(&targetUrl));
    DStringFree(&targetUrl);
    return TCL_RETURN;
    }

 /* check for expired tickets */
 if (time(0) > ticketPtr->ticketExp)
    {
    DStringAppend(&targetUrl, DStringValue(&TicketGlobalData(TicketExpHandle
    DStringAppend(&targetUrl, DStringValue(&ticketPtr->fields), -1);
    DStringAppend(&targetUrl, "&url=", -1);
    DStringAppend(&targetUrl, DStringValue(&reqPtr->url), -1);
    IncTicketCounter(CountExpiredTicket);
```

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```
        HTTP_Error(reqPtr, REDIRECT, DStringValue(&targetUrl));
        DStringFree(&targetUrl);
        return TCL_RETURN;
        }
    }

/* no handler, punt a message */
HTTP_Error(reqPtr, FORBIDDEN, "access denied by Require ticket/sid region co
IncTicketCounter(CountNoRedirects);
if (!ticketPtr->valid)
DStringFree(&ticketPtr->sid);
DStringFree(&targetUrl);
DStringFree(&escapeUrl);
return TCL_RETURN;
}
```

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```
/*
 *----------------------------------------------------------------------
 *
 * Get[Ascii]Domain --
 *
 *      These routine performs an ascii to binary domain name lookup,
 *      indexed by 'key') from the server's domain name catalog.  Name/number
 *      pair's are loaded into the catalog at configuration time with the
 *      with the "Domain" configuration command. The Ascii version returns
 *      a pointer to a character string that represents the domain number.
 *      The non Ascii version returns an integer representing the domain number.
 *
 * Results:
 *      Integer value of domain.  If no domain is available, returns deflt.
 *
 * Side effects:
 *      None.
 *
 *----------------------------------------------------------------------
 */
static int GetDomain(char *domname, int deflt)
    {
    HashEntry *entryPtr;
    DString DomName;


    DStringInit(&DomName);
    DStringAppend(&DomName, domname, -1);
    strtolower(DStringValue(&DomName));


    entryPtr = FindHashEntry(&TicketServerData.Domains, DStringValue(&DomName));
    DStringFree(&DomName);
    if (entryPtr == NULL) return deflt;
    return (int) GetHashValue(entryPtr);
    }

static char * GetAsciiDomain(char *domname, char *deflt)
    {
    HashEntry *entryPtr;
    static char buffer[64];
    DString DomName;


    DStringInit(&DomName);
    DStringAppend(&DomName, domname, -1);
    strtolower(DStringValue(&DomName));

    entryPtr = FindHashEntry(&TicketServerData.Domains, DStringValue(&DomName));
    DStringFree(&DomName);
    if (entryPtr == NULL) return deflt;
    sprintf(buffer,"%d", (int) GetHashValue(entryPtr));
    return buffer;
   }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_InsertLocalSid --
 *
 *      Given a URL, inspect it to see if it refers to the local server/port
 *      if it does, and it does not already contain a SID, insert one if
 *      the current request included one. Note, for port 80 access we look
 *      for a match with and without the port specifier.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      A SID may be inserted into the URL.
 *
 *----------------------------------------------------------------------
 */
void TICKET_InsertLocalSid(HTTP_Request *reqPtr, DString *result)
    {
    HTTP_Server *serverPtr;
    TICKET_Request *ticketPtr;
    char tmp[32];
    DString pattern1;
    DString pattern2;
    DString tmp_url;
    DString *hitPattern = NULL;


    ticketPtr = (TICKET_Request *) HT_GetReqExtData(reqPtr, TicketServerData.tic
    if (ticketPtr == NULL) return;
    serverPtr = reqPtr->serverPtr;

    DStringInit(&pattern1);
    DStringInit(&pattern2);
    DStringInit(&tmp_url);


    DStringAppend(&pattern1, "http://", -1);
    DStringAppend(&pattern1, DStringValue(&serverPtr->serverName), -1);
    DStringAppend(&pattern2, DStringValue(&pattern1), -1);
    sprintf(tmp, ":%d", serverPtr->server_port);
    DStringAppend(&pattern1, tmp, -1);

    if ((DStringLength(result) >= DStringLength(&pattern1)) &&
        (strncasecmp(DStringValue(&pattern1), DStringValue(result), DStringLengt
        hitPattern = &pattern1;
    else
    if ((serverPtr->server_port == 80) &&
        (DStringLength(result) >= DStringLength(&pattern2)) &&
        (strncasecmp(DStringValue(&pattern2), DStringValue(result), DStringLengt
        hitPattern = &pattern2;

    if (hitPattern != NULL)
      {
      DStringAppend(&tmp_url, DStringValue(hitPattern), -1);
      DStringAppend(&tmp_url, DStringValue(&ticketPtr->sid), -1);
      DStringAppend(&tmp_url, &DStringValue(result)[DStringLength(hitPattern)],
      DStringFree(result);
```

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```
    DStringAppend(result, DStringValue(&tmp_url), -1);
    DStringFree(&tmp_url);
    }
  DStringFree(&pattern1);
  DStringFree(&pattern2);
  DStringFree(&tmp_url);
  }
```

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```
/*
 *------------------------------------------------------------------------
 *
 * CreateSid --
 *
 *      This routine takes the passed arguments and creates a sid.
 *
 * Results:
 *      A sid.
 *
 * Side effects:
 *
 *------------------------------------------------------------------------
 */

char * CreateSid(HTTP_Request *reqPtr, int dom, int uid, int kid,
                        int exp, int uctx)

    {
    int bsid[3]= {0,0,0};
    char temp_str[512];
    DString hash;
    int act_hash;
    static char sid[64];
    unsigned int expire_time;
    char *secret;
    char *hashP;
    char *cp;
    unsigned char *ecp;
    unsigned int eda;
    int endian = 1;



    DStringInit(&hash);
    expire_time = time(0)+ exp;

    put_sid(dom_lw,    dom_pos,   dom_mask,   dom);
    put_sid(uid_lw,    uid_pos,   uid_mask,   uid);
    put_sid(kid_lw,    kid_pos,   kid_mask,   kid);
    put_sid(exp_lw,    exp_pos,   exp_mask,   (expire_time>>exp_shft_amt))
    put_sid(uctx_lw,   uctx_pos,  uctx_mask,  uctx);
    put_sid(rev_lw,    rev_pos,   rev_mask,   sid_rev_zero);

    secret = GetSecret(kid);
    ASSERT (secret != NULL);
    DStringAppend(&hash, secret, -1);
    DStringAppend(&hash, DStringValue(&reqPtr->remoteAddr), -1);
    sprintf(temp_str, "%08x%08x", bsid[2],bsid[1]);
    DStringAppend(&hash, temp_str, -1);
    /* format of the hash string is %s%s%08x%08x", secret,ip_addr,bsid[2],bsid[1

    hashP = DStringValue(&hash);
    act_hash = compute_ihash(hashP);
    while (*hashP != 0) *hashP++ = 0;
    DStringFree(&hash);

/*  fix_endian(&act_hash, ecp, eda); */
```

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```
   .put_sid(sig_lw, sig_pos, sig_mask, act_hash)

/*  fix_endian(&bsid[0], ecp, eda); */
    fix_endian(&bsid[1], ecp, eda);
    fix_endian(&bsid[2], ecp, eda);

#if (1 == 0)
    DumpSid();
#endif

    cp = radix64encode_noslash((char *) bsid, 12);
    strcpy(sid, SID_prefix);
    strcat(sid, cp);
    free(cp);
    return(sid);
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * compute_ihash --
 *
 *  Compute the MD5 hash for the specified string, returning the hash as
 *  a 32b xor of the 4 hash longwords.
 *
 * Results:
 *      hash int.
 *
 * Side effects:
 *      None.
 *----------------------------------------------------------------------
 */
static int compute_ihash(char *str)
    {
    MD5_CTX md5;
    unsigned char hash[16];
    unsigned int *pl;
    unsigned int hashi = 0;

    MD5Init(&md5);
    MD5Update(&md5, (unsigned char *) str, strlen(str));
    MD5Final(hash, &md5);
    pl =  (unsigned int *) hash;

    hashi = *pl++;
    hashi ^= *pl++;
    hashi ^= *pl++;
    hashi ^= *pl++;
    return hashi;
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * computeHash --
 *
 *  Compute the MD5 hash for the specified string, returning the hash as
 *  a 32-character hex string.
 *
 * Results:
 *      Pointer to static hash string.
 *
 * Side effects:
 *      None.
 *----------------------------------------------------------------------
 */
static char *computeHash(char *str)
{
    int i;
    MD5_CTX md5;
    unsigned char hash[16];
    static char hashstr[33];
    char *q;

    MD5Init(&md5);
    MD5Update(&md5, (unsigned char *) str, strlen(str));
    MD5Final(hash, &md5);
    q = hashstr;
    for(i=0; i<16; i++) {
        sprintf(q, "%02x", hash[i]);
        q += 2;
    }
    *q = '\0';
    return hashstr;
}
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_ParseTicket --
 *
 *      Called by dorequest, before any region commands or mount handlers
 *      have run. We parse and handle incomeing sid's and tickets.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *
 *----------------------------------------------------------------------
 */

int TICKET_ParseTicket(HTTP_Request *reqPtr)
    {
    int status = HT_OK;

    IncTicketCounter(CountTotalUrl);

    status = ParseSid(reqPtr);
    if (TicketGlobalData(EnableTicket) && (status == HT_OK)) status = ParseTicke
    return status;
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * ParseSid --
 *
 *      Called by TICKET_ParseTicket, before any region commands or mount handle
 *      have run. We parse and handle incomeing sid's.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *
 *----------------------------------------------------------------------
 */

int ParseSid(HTTP_Request *reqPtr)
    {
    TICKET_Request *ticketPtr;
    HTTP_Server *serverPtr;
    DString hash;
    int i;
    char *cp, *cp1;
    int *bsid=NULL, act_hash;
    unsigned int cur_tim, tdif, exp_tim;
    char *secret;
    char temp_str[512];
    char *hashP;
    int sid_ok = 0;
    unsigned char *ecp;
    unsigned int eda;
    int endian = 1;
    int ip1,ip2,ip3,ip4;


    /* fetch the server private ticket extension data */
    /* note that this sets up a default ticket block for both SID's and Ticket a
    serverPtr = reqPtr->serverPtr;
    ticketPtr = (TICKET_Request *) HT_GetReqExtData(reqPtr, TicketServerData.tic
    ASSERT (ticketPtr == NULL);

    ticketPtr = (TICKET_Request *) Malloc(sizeof(TICKET_Request));
    HT_AddReqExtData(reqPtr, TicketServerData.ticketExtensionId, ticketPtr, free
    DStringInit(&ticketPtr->rawUrl);
    DStringInit(&ticketPtr->sid);
    DStringInit(&ticketPtr->fields);
    DStringInit(&ticketPtr->signature);
    DStringInit(&ticketPtr->ticketIP);
    ticketPtr->valid      = 0;
    ticketPtr->sidDom     = -1;
    ticketPtr->ticketDom = -1;
    ticketPtr->ticketExp = -1;
    ticketPtr->uid        = 0;
    ticketPtr->uctx       = 0;
    sscanf(DStringValue(&reqPtr->remoteAddr), "%d.%d.%d.%d", &ip1, &ip2, &ip3, &
    ticketPtr->uid = (((ip1+ip2)<<24) | ((ip3+ip4)<<16) | (rand() & 0xFFFF));
    ticketPtr->uctx  = 1;
```

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```
/* we are done if sids are not enabled, or this url does not have a sid */
if (!(TicketGlobalData(EnableSid))) return HT_OK;
cp1 = DStringValue(&reqPtr->url);
if (strstr(cp1, SID_prefix) != cp1)
  return HT_OK;
if (strlen(cp1) == sidLength)
  {
  DStringAppend(&reqPtr->url, "/", -1);
  DStringAppend(&reqPtr->path, "/", -1);
  cp1 = DStringValue(&reqPtr->url);
  }
cp = strchr(cp1+sizeof(SID_prefix),'/');
if ((cp - cp1) != sidLength)
  return HT_OK;
IncTicketCounter(CountSidUrl);


DStringInit(&hash);

/* if sid eater is enabled, rewrite the url without the sid, and reprocess t
if (TicketGlobalData(EnableSidEater))
  {
  DStringAppend(&hash, DStringValue(&reqPtr->url), -1);
  DStringFree(&reqPtr->url);
  DStringAppend(&reqPtr->url, DStringValue(&hash)+sidLength, -1);
  DStringTrunc(&hash, 0);
  DStringAppend(&hash, DStringValue(&reqPtr->path), -1);
  DStringFree(&reqPtr->path);
  DStringAppend(&reqPtr->path, DStringValue(&hash)+sidLength, -1);
  DStringFree(&hash);
  IncTicketCounter(CountDiscardedSidUrl);
  return HT_OK;
  }


DStringAppend(&ticketPtr->sid,  DStringValue(&reqPtr->url), sidLength);

/* first convert the SID back to binary*/
i = DStringLength(&ticketPtr->sid)-3;
bsid = (int *) radix64decode_noslash(DStringValue(&ticketPtr->sid)+3, i, &i)
if ((bsid == NULL) || (i != 12)) goto rtn_exit;

fix_endian(&bsid[0], ecp, eda);
fix_endian(&bsid[1], ecp, eda);
fix_endian(&bsid[2], ecp, eda);

/* check the SID version field */
if (get_sid(rev_lw,rev_pos,rev_mask) != sid_rev_zero) goto sid_bad;
if (get_sid(rsrv1_lw,rsrv1_pos,rsrv1_mask) != 0) goto sid_bad;
if (get_sid(rsrv2_lw,rsrv2_pos,rsrv2_mask) != 0) goto sid_bad;

/* Get a pointer to the secret */
secret = GetSecret(get_sid(kid_lw,kid_pos,kid_mask));
if (secret == NULL) goto sid_bad;

 /* hash the sid and check the signature */
DStringAppend(&hash, secret, -1);
```

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```
  .DStringAppend(&hash, DStringValue(&reqPtr->remoteAddr), -1);
   sprintf(temp_str, "%08x%08x", bsid[2],bsid[1]);
   DStringAppend(&hash, temp_str, -1);
   /* format of the hash string is %s%s%08x%08x", secret,ip_addr,bsid[2],bsid[1

   hashP = DStringValue(&hash);
   act_hash = compute_ihash(hashP);
   while (*hashP != 0) *hashP++ = 0;


   fix_endian(&act_hash, ecp, eda);
   if (act_hash != get_sid(sig_lw,sig_pos,sig_mask)) goto  sid_bad;


   /* is is ok, may be expired, but good enough to id user */
   ticketPtr->uid = get_sid(uid_lw,uid_pos,uid_mask);
   ticketPtr->uctx = get_sid(uctx_lw,uctx_pos,uctx_mask);

   /* do the SID experation processing */
   cur_tim = (time(0)>>exp_shft_amt) & exp_mask;
   exp_tim = get_sid(exp_lw,exp_pos,exp_mask);
   tdif = (exp_tim - cur_tim) & 0xffff;
   if (tdif > 0x7fff)
     {
     IncTicketCounter(CountExpSid);
     goto sid_exp;
     }

   /* sid is fine, save the sid state, update the url's */
   ticketPtr->sidDom = get_sid(dom_lw,dom_pos,dom_mask);
   ticketPtr->valid = 1;
   sid_ok = 1;
   IncTicketCounter(CountValidSid);

 sid_bad:
   if (!(sid_ok)) IncTicketCounter(CountInvalidSid);
 sid_exp:
   DStringAppend(&ticketPtr->rawUrl, DStringValue(&reqPtr->path), -1);
   DStringTrunc(&reqPtr->path, 0);
   DStringAppend(&reqPtr->path, DStringValue(&ticketPtr->rawUrl)+sidLength, -1)

   DStringTrunc(&ticketPtr->rawUrl, 0);
   DStringAppend(&ticketPtr->rawUrl, DStringValue(&reqPtr->url), -1);
   DStringTrunc(&reqPtr->url, 0);
   DStringAppend(&reqPtr->url, DStringValue(&ticketPtr->rawUrl)+sidLength, -1);

 rtn_exit:
   DStringFree(&hash);
   if (bsid != NULL) free(bsid);
   return HT_OK;
   }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * freeTicketReqData
 *
 *       This routine frees the storage used by ticket specific request
 *       data.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Memory freed.
 *
 *----------------------------------------------------------------------
 */
static void freeTicketReqData(void *dataPtr)
    {
    TICKET_Request *ticketPtr = dataPtr;
    DStringFree(&ticketPtr->rawUrl);
    DStringFree(&ticketPtr->sid);
    DStringFree(&ticketPtr->fields);
    DStringFree(&ticketPtr->signature);
    DStringFree(&ticketPtr->ticketIP);
    free(ticketPtr);
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * GetSecret --
 *
 *      Given a binary keyID, returns an ascii secret from the
 *      secrets store.
 *      for untranslatable names, return NULL.
 *
 * Results:
 *      "I've got a secret, now you do too"
 *
 * Side effects:
 *
 *
 *----------------------------------------------------------------------
 */

char *GetSecret(int kid)
    {
    HashEntry *entryPtr;

    entryPtr = FindHashEntry(&TicketServerData.SecretsKid, (void *) kid);
    if(entryPtr == NULL) return NULL;
    return DStringValue((DString *)GetHashValue(entryPtr));
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * GetKidByKeyID --
 *
 *      Given an ascii  KeyID return the binary KeyID.
 *      for untranslatable names, return -1.
 *
 * Results:
 *      "I've got a secret, now you do too"
 *
 * Side effects:
 *
 *
 *----------------------------------------------------------------------
 */

int GetKidByKeyID(char *keyID)
    {
    HashEntry *entryPtr;

    entryPtr = FindHashEntry(&TicketServerData.KeyID, (void *) keyID);
    if(entryPtr == NULL) return -1;
    return (int) GetHashValue(entryPtr);
    }
```

```
/*
 *----------------------------------------------------------------------
 *
 * fieldParse --
 *
 *  Given a string, a separator character, extracts a field up to the
 *  separator into the result string.
 *  Does substitution on '%XX' sequences, and returns the pointer to the
 *  character beyond last character in '*endptr'.
 *
 * Results:
 *      Returns a malloc'ed string (caller must free), or NULL if an
 *      error occurred during processing (such as an invalid '%' sequence).
 *
 * Side effects:
 *      None.
 *
 *----------------------------------------------------------------------
 */
#define SIZE_INC 200
static char *fieldParse(char *str, char sep, char **endptr)
{
    char buf[3];
    char c;
    char *end, *data, *p;
    int maxlen, len;

    len = 0;
    maxlen = SIZE_INC;
    p = data = malloc(maxlen);

  /*
   * Loop through string, until end of string or sep character.
   */
    while(*str && *str != sep) {

        if(*str == '%') {
            if(!isxdigit(str[1]) || !isxdigit(str[2])) {
                free(data);
                return NULL;
            }
            buf[0] = str[1];
            buf[1] = str[2];
            buf[2] = '\0';
            c = strtol(buf, &end, 16);
            str += 3;
        } else if(*str == '+') {
            c = ' ';
            str++;
        } else
            c = *str++;

        *p++ = c;
        len++;
        if(len >= maxlen) {
            maxlen += SIZE_INC;
            data = realloc(data, maxlen);
            p = data + len;
        }
```

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```
      }
      *p++ = '\0';
      *endptr = str;
      return data;
}
```

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```
/*
 *----------------------------------------------------------------------
 *
 * DomainNameCmd --
 *
 *      A call to this routine, builds the ascii domain name
 *      to binary domain name maping structure for a numeric domain.
 *      Syntax is Domain number name1 name2 name3 name... name_last
 *      At least one name is required. The number is decimal and
 *      can be any value except -1. -1 is reserved as a marker
 *      for untranslatable names.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Commands are validate, and entries added to the map
 *
 *----------------------------------------------------------------------
 */

static int DomainNameCmd(ClientData clientData, Tcl_Interp *interp,
                            int argc, char **argv)
    {
    int new,i;
    HashEntry *entryPtr;
    int DomNumber;
    DString DomName;


    if (argc <3)
      {
      Tcl_AppendResult(interp, argv[0], " directive:  wrong number of "
                 "arguments, should be \"3\"",
                 (char *) NULL);
      return TCL_ERROR;
      }

    DStringInit(&DomName);


    if (((sscanf(argv[1], "%d", &DomNumber) != 1) || (DomNumber == -1)))
      {
      Tcl_AppendResult(interp, argv[0], " directive:  ",
                 "Domain number must be an integer, and not equal to -1",
                 ", value found was ",argv[1],
                 (char *) NULL);
      return TCL_ERROR;
      }

    for (i = 2; i < argc; i++)
      {
      DStringFree(&DomName);
      DStringAppend(&DomName, argv[i], -1);
      strtolower(DStringValue(&DomName));
      entryPtr = CreateHashEntry(&TicketServerData.Domains, DStringValue(&DomNam
      if (new == 0)
        {
        Tcl_AppendResult(interp, argv[0], " directive:  ",
                "Duplicate domain name specified, '", argv[i], "'",
                (char *) NULL);
        return TCL_ERROR;
        }
      SetHashValue(entryPtr, DomNumber);
      }
    DStringFree(&DomName);
    return TCL_OK;
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * SecretsCmd --
 *
 *      A call to this routine, builds kid to secrets table
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Secrets are stored.
 *
 *----------------------------------------------------------------------
 */

static int SecretsCmd(ClientData clientData, Tcl_Interp *interp,
                                int argc, char **argv)
    {
    int newKid,newKeyID;
    HashEntry *entryPtrKid = NULL , *entryPtrKeyID = NULL;
    int Kid;
    DString *dsptrKid;


    if (argc != 4)
      {
      Tcl_AppendResult(interp, argv[0], " directive:  wrong number of "
                "arguments, should be \"4\"",
                (char *) NULL);
      return TCL_ERROR;
      }

    if (sscanf(argv[2], "%d", &Kid) != 1)
      {
      Tcl_AppendResult(interp, argv[0],
                " directive:  KeyID must be an integer",
                ", value found was '",argv[2],"'",
                (char *) NULL);
      return TCL_ERROR;
      }

    entryPtrKid = CreateHashEntry(&TicketServerData.SecretsKid, (void *) Kid, &n
    if (strlen(argv[1]))
      entryPtrKeyID = CreateHashEntry(&TicketServerData.KeyID, (void *) argv[1],
    if ((newKid == 0) || ((newKeyID == 0) && strlen(argv[1])))
      {
      Tcl_AppendResult(interp, argv[0],
                " directive:  Duplicate Secret specified for KeyID '",
                argv[1],
                (char *) NULL);
      return TCL_ERROR;
      }

    if (strlen(argv[1]))
      {
      dsptrKid = (DString *) malloc(sizeof(DString));
      DStringInit(dsptrKid);
      DStringAppend(dsptrKid, argv[3], -1);
```

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```
    SetHashValue(entryPtrKid, dsptrKid);
    }

  SetHashValue(entryPtrKeyID, Kid);
  return TCL_OK;
  }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_Initialize --
 *
 *      Calls all the necessary routines to initialize the ticket subsystem.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Commands added to the region interpreter.
 *      SID "/@@" url catcher declared.
 *
 *----------------------------------------------------------------------
 */

int TICKET_Initialize(HTTP_Server *serverPtr, Tcl_Interp *interp)
    {
    TicketServerData.ticketExtensionId = HT_RegisterExtension(serverPtr, "ticket

    InitHashTable(&TicketServerData.SecretsKid, TCL_ONE_WORD_KEYS);
    InitHashTable(&TicketServerData.KeyID,    TCL_STRING_KEYS);
    InitHashTable(&TicketServerData.Domains, TCL_STRING_KEYS);

    /* initialize Server ticket data */
    DStringInit(&TicketGlobalData(AuthServer));
    DStringInit(&TicketGlobalData(TicketExpHandler));
    DStringInit(&TicketGlobalData(TicketAdrHandler));
    TicketGlobalData(FreeArea)                = 0;
    TicketGlobalData(EnableLocalAuth)         = 0;
    TicketGlobalData(CurrentSecret)           = 0;
    TicketGlobalData(EnableSid)               = 0;
    TicketGlobalData(EnableTicket)            = 0;
    TicketGlobalData(EnableSidEater)          = 0;
    TicketGlobalData(LocalAuthExp)            = 60*30;

    /* ticket event counters */
    TicketGlobalData(CountTotalUrl)           = 0;
    TicketGlobalData(CountSidUrl)             = 0;
    TicketGlobalData(CountValidSid)           = 0;
    TicketGlobalData(CountExpSid)             = 0;
    TicketGlobalData(CountInvalidSid)         = 0;
    TicketGlobalData(CountCrossDomain)        = 0;
    TicketGlobalData(CountLocalRedirects)     = 0;
    TicketGlobalData(CountRemoteRedirects)    = 0;
    TicketGlobalData(CountNoRedirects)        = 0;
    TicketGlobalData(CountDiscardedSidUrl)    = 0;


    /* Ticket related Config commands */
    Tcl_CreateCommand(interp, "Domain",                DomainNameCmd,
                      (ClientData) serverPtr, NULL);
    Tcl_CreateCommand(interp, "Secrets",               SecretsCmd,
                      (ClientData) serverPtr, NULL);
    Tcl_CreateCommand(interp, "AuthenticationServer", CmdStringValue,
              (ClientData) &TicketGlobalData(AuthServer), NULL);
    Tcl_CreateCommand(interp, "TicketExpirationHandler", CmdStringValue,
              (ClientData) &TicketGlobalData(TicketExpHandler), NULL);
```

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```
Tcl_CreateCommand(interp, "TicketAddressHandler", CmdStringValue,
          (ClientData) &TicketGlobalData(TicketAdrHandler), NULL);
Tcl_CreateCommand(interp, "FreeDomain",            CmdIntValue,
          (ClientData) &TicketGlobalData(FreeArea), NULL);
Tcl_CreateCommand(interp, "EnableSidEater",        CmdIntValue,
          (ClientData) &TicketGlobalData(EnableSidEater), NULL);
Tcl_CreateCommand(interp, "EnableSid",             CmdIntValue,
          (ClientData) &TicketGlobalData(EnableSid), NULL);
Tcl_CreateCommand(interp, "EnableTicket",             CmdIntValue,
          (ClientData) &TicketGlobalData(EnableTicket), NULL);
Tcl_CreateCommand(interp, "EnableLocalAuth",       CmdIntValue,
          (ClientData) &TicketGlobalData(EnableLocalAuth), NULL);
Tcl_CreateCommand(interp, "CurrentSecret",         CmdIntValue,
          (ClientData) &TicketGlobalData(CurrentSecret), NULL);
Tcl_CreateCommand(interp, "LocalAuthExp",          CmdIntValue,
          (ClientData) &TicketGlobalData(LocalAuthExp), NULL);

HT_AddMountHandler(serverPtr, (ClientData) NULL, TICKET_DebugHooks,
    "/omiserver", NULL);

return HT_OK;
}
```

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```
/*
 *-----------------------------------------------------------------------
 *
 * TICKET_Shutdown --
 *
 *      Calls all the necessary routines to shutdown the ticket subsystem.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Memory freed
 *
 *-----------------------------------------------------------------------
 */

void TICKET_Shutdown(HTTP_Server *serverPtr)
    {
    HashEntry *entryPtr;
    HashSearch search;
    DString   *dstring;

    DStringFree(&TicketGlobalData(AuthServer));
    DStringFree(&TicketGlobalData(TicketExpHandler));
    DStringFree(&TicketGlobalData(TicketAdrHandler));

    entryPtr = FirstHashEntry(&TicketServerData.SecretsKid, &search);
    while (entryPtr != NULL)
      {
      dstring = GetHashValue(entryPtr);
      DStringFree(dstring);
      free(dstring);
      entryPtr = NextHashEntry(&search);
      }
    DeleteHashTable(&TicketServerData.SecretsKid);

    DeleteHashTable(&TicketServerData.KeyID);

    DeleteHashTable(&TicketServerData.Domains);
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_AddRegionCommands --
 *
 *      Add TICKET region commands for authentication/authorization decisions.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Commands added to the region interpreter.
 *
 *----------------------------------------------------------------------
 */

void TICKET_AddRegionCommands(HTTP_Request *reqPtr, Tcl_Interp *interp)
    {
    Tcl_CreateCommand(interp, "RequireSID", TICKET_RequireSidCmd,
                    (ClientData) reqPtr, NULL);
    Tcl_CreateCommand(interp, "RequireTicket", TICKET_RequireTicketCmd,
                      (ClientData) reqPtr, NULL);
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_GetCGIVariables --
 *
 *      Add TICKET CGI variables to the CGI variable table.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      Extends the CGI variable hash table.
 *
 *----------------------------------------------------------------------
 */

void TICKET_GetCGIVariables(HTTP_Request *req)
    {
    TICKET_Request *ticketPtr = (TICKET_Request *) HT_GetReqExtData(req, TicketS

    /*
     * If there's no extension data, then we're not doing a ticket.  Just return
     */

    if (ticketPtr == NULL)
        return;

    if (DStringLength(&ticketPtr->rawUrl) != 0)
      HT_AddCGIParameter(req, "TICKET_URL", DStringValue(&ticketPtr->rawUrl), FA
    if (DStringLength(&ticketPtr->sid) != 0)
      HT_AddCGIParameter(req, "TICKET_SID", DStringValue(&ticketPtr->sid), FALSE
    if (DStringLength(&ticketPtr->fields) != 0)
      HT_AddCGIParameter(req, "TICKET_FIELDS", DStringValue(&ticketPtr->fields),
    if (DStringLength(&ticketPtr->signature) != 0)
      HT_AddCGIParameter(req, "TICKET_SIGNATURE", DStringValue(&ticketPtr->signa
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_GetUrl
 *
 *      Return the original url (with sid)
 *
 * Results:
 *      The URL.
 *
 * Side effects:
 *      None.
 *
 *----------------------------------------------------------------------
 */
char * TICKET_GetUrl(HTTP_Request *reqPtr)
    {
    TICKET_Request *ticketPtr;

    ticketPtr = (TICKET_Request *)
      HT_GetReqExtData(reqPtr, TicketServerData.ticketExtensionId);
    if ((ticketPtr != NULL) &&
        (DStringLength(&ticketPtr->rawUrl) != 0))
      return DStringValue(&ticketPtr->rawUrl);
    else
      return DStringValue(&reqPtr->url);
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_ConfigCheck
 *
 *      Perform late configuration checks
 *
 * Results:
 *
 *
 * Side effects:
 *      Possible message loged/printed, and program exit'd.
 *
 *----------------------------------------------------------------------
 */
void TICKET_ConfigCheck()
    {
    HashEntry *entryPtr;
    int kid;

    if ((TicketGlobalData(EnableSid) & ~0x1) != 0)
      {
      LogMessage(LOG_ERR, "EnableSid must be 0 or 1");
      exit(0);
      }

    if (!(TicketGlobalData(EnableSid))) return;

    kid = TicketGlobalData(CurrentSecret);
    if ((kid && kid_mask) != kid)
      {
      LogMessage(LOG_ERR, "CurrentSecret %d is invalid", kid);
      exit(0);
      }

    entryPtr = FindHashEntry(&TicketServerData.SecretsKid, (void *) kid);
    if(entryPtr == NULL)
      {
      LogMessage(LOG_ERR, "No secret defined for CurrentSecret %d", kid);
      exit(0);
      }

    if ((TicketGlobalData(FreeArea) & ~0x255) != 0)
      {
      LogMessage(LOG_ERR, "FreeArea must be between 0 and 255");
      exit(0);
      }

    if ((TicketGlobalData(EnableSidEater) & ~0x1) != 0)
      {
      LogMessage(LOG_ERR, "EnableSidEater must be 0 or 1");
      exit(0);
      }

    if ((TicketGlobalData(EnableTicket) & ~0x1) != 0)
      {
      LogMessage(LOG_ERR, "EnableTicket must be 0 or 1");
      exit(0);
      }
```

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```
if ((TicketGlobalData(EnableLocalAuth) & ~0x1) != 0)
    {
    LogMessage(LOG_ERR, "EnablLocalAuth must be 0 or 1");
    exit(0);
    }
}
```

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```
/*
 *----------------------------------------------------------------------
 *
 * TICKET_DebugHooks
 *
 *      Check for debug hooks and execute if found.
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      None.
 *
 *----------------------------------------------------------------------
 */
static void TICKET_DebugHooks(ClientData clientData, char *suffix,
                              HTTP_Request *reqPtr)
    {
    if(strcmp(suffix, "/ticketstatus") == 0)
      {
      DumpStatus(reqPtr);
      HT_FinishRequest(reqPtr);
      return;
      }
    HTTP_Error(reqPtr, NOT_FOUND, "access denied due to poorly formed url");
    HT_FinishRequest(reqPtr);
    return;
    }
```

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```
/*
 *----------------------------------------------------------------------
 *
 * DumpStatus --
 *
 *      Dump the server's ticket stat's
 *
 * Results:
 *      None.
 *
 * Side effects:
 *      None.
 *
 *----------------------------------------------------------------------
 */
#define BUFSIZE 1024
static void DumpStatus(HTTP_Request *reqPtr)
{
    HTTP_Server *serverPtr = reqPtr->serverPtr;
    char tmp[BUFSIZE], timeStr[BUFSIZE];
    struct utsname sysinfo;
    time_t uptime;
    int hours;


    HTTP_BeginHeader(reqPtr, "200 OK");
    HTTP_SendHeader(reqPtr, "Content-type: text/html", NULL);
    HTTP_EndHeader(reqPtr);
    HTTP_Send(reqPtr, "<title>WebServer Ticket Status</title>",
                      "<h1>WebServer Ticket Status</h1>", NULL);

    HTTP_Send(reqPtr, "<p><hr><p><h2>Ticket Log</h2>","<p><pre>\n", NULL);

    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of access          ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of SID URL's       ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of Valid SID's     ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of Expired SID's   ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of Invalid SID's   ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of XDomain accesses", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of Local Redirects ", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of Remote Redirects", Ticket
    HTTP_Send(reqPtr, tmp, NULL);
    sprintf(tmp, "    <b>%s:  </b>  %d\n", "Number of No Auth servers ", Ticket


    HTTP_Send(reqPtr, tmp, "</pre>", NULL);


    uptime = time(NULL) - serverPtr->started;
    uname(&sysinfo);
    strftime(timeStr, BUFSIZE, "%A, %d-%b-%y %T",
        localtime(&serverPtr->started));
```

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```
    sprintf(tmp, "Server running on <b>%s</b> (%s %s) port %d, has been up \
                  since %s.<p>", sysinfo.nodename, sysinfo.sysname,
                    sysinfo.release, serverPtr->server_port, timeStr);
    HTTP_Send(reqPtr, tmp, NULL);

    sprintf(tmp, "     <b>Number of connections:     </b> %d\n",
            serverPtr->numConnects);
    HTTP_Send(reqPtr, "<p><pre>\n", tmp, NULL);

    sprintf(tmp, "     <b>Number of HTTP requests:   </b> %d\n",
            serverPtr->numRequests);
    HTTP_Send(reqPtr, tmp, "</pre><p>", NULL);

    hours = max(uptime / 3600, 1);
    sprintf(tmp, "This server is averaging <b>%d</b> requests per hour.<p>",
            serverPtr->numRequests/hours);
    HTTP_Send(reqPtr, tmp, NULL);

    DumpRusage(reqPtr);
/*  DumpConnections(reqPtr); */

    DNS_DumpStats(reqPtr);

    HTTP_Send(reqPtr, "<p><hr><address>", DStringValue(&ht_serverSoftware),
            "</address>\n", NULL);


    reqPtr->done = TRUE;

}
#undef BUFSIZE
```

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```
User: morris
Host: uprism.openmarket.com
Class: uprism.openmarket.com
Job: t.t
```

What is claimed is:

1. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

forwarding a service request from the client to the server system, wherein communications between the client and server system are according to hypertext transfer protocol;

returning a session identifier from the server system to the client; and

appending as part of a path name in a uniform resource locator the session identifier to the request and to subsequent service requests from the client to the server system within a session of requests.

2. A method as claimed in claim 1 wherein the session identifier includes a user identifier.

3. A method as claimed in claim 1 wherein the session identifier includes an expiration time for the session.

4. A method as claimed in claim 1 wherein the server system records information from the session identifier in a transaction log in the server system.

5. A method as claimed in claim 4 wherein the server system tracks the access history of sequences of service requests within a session of requests.

6. A method as claimed in claim 5 wherein the server system tracks the access history to determine service requests leading to a purchase made within the session of requests.

7. A method as claimed in claim 4 wherein the server system counts requests to particular services exclusive of repeated requests from a common client.

8. A method as claimed in claim 4 wherein the server system maintains a data base relating customer information to access patterns.

9. A method as claimed in claim 8 wherein the information includes customer demographics.

10. A method as claimed in claim 1 wherein the server system assigns the session identifier to an initial service request to the server system.

11. A method as claimed in claim 1 wherein the server system subjects the client to an authorization routine prior to issuing the session identifier and the session identifier is protected from forgery.

12. A method as claimed in claim 1 wherein the server system comprises plural servers including an authentication server which provides session identifiers for service requests to multiple servers.

13. A method as claimed in claim 12 wherein:

a client directs a service request to a first server which is to provide the requested service;

the first server checks the service request for a session identifier and only services a service request having a valid session identifier, and where the service request has no valid identifier:

the first server redirects the service request from the client to the authorization server;

the authorization server subjects the client to the authorization routine and issues the session identifier to be appended to the service request to the first server;

the client forwards the service request appended with the session identifier to the first server; and

the first server recognizes the session identifier and services the service request to the client; and

the client appends the session identifier to subsequent service requests to the server system and is serviced without further authorization.

14. A method as claimed in claim 13 wherein the session identifier includes a user identifier.

15. A method as claimed in claim 13 wherein the session identifier includes an expiration time for the session.

16. A method as claimed in claim 13 wherein the session identifier provides access to a protected domain to which the session has access authorization.

17. A method as claimed in claim 16 wherein the session identifier is modified for access to a different protected domain.

18. A method as claimed in claim 13 wherein the session identifier provides a key identifier for key management.

19. A method as claimed in claim 13 wherein the server system records information from the session identifier in a transaction log in the server system.

20. A method as claimed in claim 13 wherein the client modifies the path name of a current uniform resource locator using relative addressing and retains the session identifier portion of the path name unmodified for successive requests in the session.

21. A method as claimed in claim 1 wherein:

the server system subjects the client to an authorization routine prior to issuing the session identifier and the session identifier is protected from forgery, records information from the session identifier in a transaction log in the server system, tracks request paths relative to hypertext pages, and maintains a data base relating customer demographics to access patterns; and

the client modifies the path name of a current uniform resource locator using relative addressing and retains the session identifier portion of the path name unmodified for successive requests in a session.

22. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

appending as part of a path name in a uniform resource locator a session identifier to the request, wherein communications between the client and server system are according to hypertext transfer protocol;

responding to requests for hypertext pages received from a client through the network by returning the requested hypertext pages to the client;

responding to further client requests related to links in the hypertext pages; and tracking the further client requests related to a particular hypertext page.

23. A method as claimed in claim 22 wherein the requests include a common session identifier and the server system tracks client requests within a session of requests.

24. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

appending a session identifier to the request as part of a path name in a uniform resource locator, wherein communications between the client and server system are according to hypertext transfer protocol; and

responding to requests for documents received from the client through the network by returning the requested documents wherein the documents are customized for a particular user based on a user profile.

25. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

responding to a request for a document received from the client through the network, wherein communications between the client and server system are according to hypertext transfer protocol;

appending a session identifier, which includes a user identification to the request as part of a path name in a uniform resource locator; and

returning the requested document wherein the document is customized for a particular user based on the user identification of the session identifier.

26. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

appending a session identifier to the request as part of a path name in a uniform resource locator, wherein communications between the client and server system are according to hypertext transfer protocol;

responding to requests for information received from the client through the network by returning the requested information to the client; and

counting requests to particular information exclusive of repeated requests from a common client.

27. A method as claimed in claim **26** comprising excluding from the counting requests made for information from the client within a defined period of time.

28. A method of processing service requests for a document received from a client through a network in which the document has been purchased by a user, said method comprising the steps of:

responding to a request for a document received from a client through the network in which the document has been purchased by the user wherein communications between the client and server system are according to hypertext transfer protocol;

appending an authorization identifier to the request as part of a path name in a uniform resource locator; and

returning the requested document if the authorization identifier indicates that the user is authorized to access the document.

29. A method as claimed in claim **28**, wherein the authorization identifier is encoded within a session identifier which is appended to the request as part of a path name in a uniform resource locator.

30. A method of processing service requests from a client to a server system through a network, said method comprising the steps of:

responding to a request for a document received from a client through the network, wherein communications between the client and server system are according to hypertext transfer protocol;

appending as part of a path name in a uniform resource locator a session identifier to the request;

returning the requested document to the client, and;

charging the user identified in the session identifier for access to the document.

31. A method as claimed in claim **30**, wherein a user identifier is encoded within a session identifier which is appended to the request.

32. An information system on a network, comprising:

means for receiving service requests from clients and for determining whether a service request includes a session identifier, wherein communications between the client and server system are according to hypertext transfer protocol;

means for appending the session identifier as part of a path name in a uniform resource locator in response to an initial service request in a session of requests; and

means for servicing service requests from a client which include the session identifier, the subsequent service request being processed in the session.

33. An information system as claimed in claim **32** wherein the means for providing the session identifier is in a server system which services the requests.

34. An information system as claimed in claim **32** further comprising an authorization routine for authorizing the client prior to issuing the session identifier and means for protecting the session identifier from forgery.

35. An information server system as claimed in claim **32** further comprising a transaction log for recording information from the session identifier.

36. An information system as claimed in claim **32** further comprising means for tracking access history of sequences of service requests within the session of requests.

37. An information system as claimed in claim **32** further comprising means for counting requests to particular services exclusive of repeated requests from a common client.

38. An information system as claimed in claim **32** further comprising a data base relating customer information to access patterns.

39. An information system as claimed in claim **38** wherein the information includes customer demographics.

40. An information server on a network, comprising:

means for appending a session identifier as part of a path name in a uniform resource locator, wherein communications between the client and server system are according to hypertext transfer protocol;

means for responding to requests for hypertext pages received from a client through the network by returning the requested hypertext pages to the client;

means for responding to further requests derived from links in the hypertext pages; and means for tracking the further requests derived from a particular hypertext page.

41. A server as claimed in claim **40** wherein the requests include a common session identifier and the server tracks requests within a session of requests.

42. A server as claimed in claim **41** further comprising a data base relating customer demographics to access patterns.

43. An information server on a network, comprising:

means for appending the session identifier as part of a path name in a uniform resource locator, wherein communications between the client and server system are according to hypertext transfer protocol;

means for responding to requests for service received from a client through a network by returning the requested service to the client; and

means for counting requests to particular service exclusive of repeated requests from a common client.

44. A server as claimed in claim **43** wherein the requests include a common session identifier and the server tracks requests within a session of requests.

45. A server as claimed in claim **43** further comprising means for excluding requests made to a service from the client within a defined period of time.

* * * * *

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(12) EX PARTE REEXAMINATION CERTIFICATE (5320th)

United States Patent

Levergood et al.

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(45) **Certificate Issued: Apr. 4, 2006**

(54) **INTERNET SERVER ACCESS CONTROL AND MONITORING SYSTEMS**

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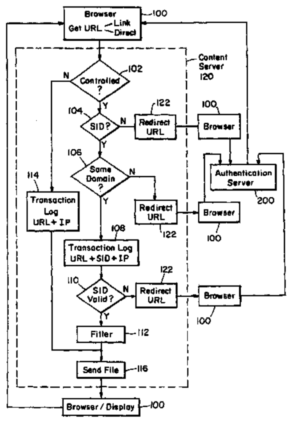
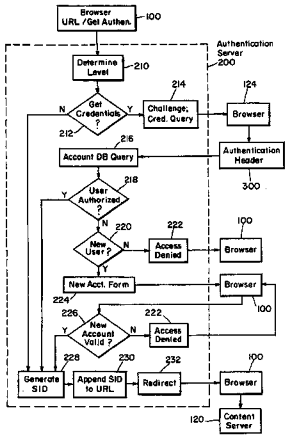
(57) **ABSTRACT**

This invention relates to methods for controlling and monitoring access to network servers. In particular, the process described in the invention includes client-server sessions over the Internet involving hypertext files. In the hypertext environment, a client views a document transmitted by a content server with a standard program known as the browser. Each hypertext document or page contains links to other hypertext pages which the user may select to traverse. When the user selects a link that is directed to an access-controlled file, the server subjects the request to a secondary server which determines whether the client has an authorization or valid account. Upon such verification, the user is provided with a session identification which allows the user to access to the requested file as well as any other files within the present protection domain.





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EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1**–**45** is confirmed.

New claims **46**–**136** are added and determined to be patentable.

46. The method of claim 1, wherein the session identifier includes a key identifier.

47. The method of claim 1, wherein the session identifier includes an Internet Protocol address of the client.

48. The method of claim 1, further comprising the step of digitally signing the session identifier prior to returning it from the server to the client.

49. The method of claim 48, wherein the session identifier includes a plurality of information fields and is digitally signed by performing a hash computation on the information fields.

50. The method of claim 49, wherein the information fields of the session identifier include a user identification field and an expiration time field.

51. The method of claim 49, wherein the information fields of the session identifier include a network address field and a key identifier field.

52. The method of claim 49, wherein the information fields of the session identifier include a domain field and a network address field.

53. The method of claim 1, further comprising the steps of:

determining that the service request is from an unauthorized user of the server; and

prior to returning a session identifier to the unauthorized client,

prompting the client to become an authorized user of the server by providing access credentials, the access credentials including a user identifier and a secret key; and

validating the access credentials as the server; and

transmitting a hypertext transfer protocol REDIRECT command back to the client along with the session identifier, wherein the REDIRECT command includes a uniform resource locator having the session identifier appended thereto.

54. The method of claim 53, further comprising:

receiving the REDIRECT command at the client and processing the command using a web browser application operating at the client, the web browser application issuing a hypertext transfer protocol GET command in response to the REDIRECT command, the GET command including the uniform resource locator with the appended session identifier.

55. The method of claim 4, wherein the information recorded in the transaction log includes the network address of the client.

56. The method of claim 1, wherein the session identifier includes an access domain to which the client is authorized to gain access, the method further comprising the steps of:

generating a relative uniform resource locator link at the client, the relative uniform resource locator link including the session identifier;

transmitting the relative uniform resource locator link to the server;

determining whether the relative uniform resource locator link is pointing to a hypertext page in the same access domain as that identified in the session identifier;

if the relative uniform resource locator link is pointing to a hypertext page in the same access domain, then the server accepts the link and transmits the requested page to the client; and

if the relative uniform resource locator link is pointing to a hypertext page in a different access domain, then the server denies the link.

57. The method of claim 56, further comprising the steps of:

after denying the link, the server transmitting a hypertext transfer protocol REDIRECT command to the client, the REDIRECT command including a uniform resource locator of an authorization server.

58. The method of claim 1, further comprising the steps of:

providing a browser program at the client; and

storing one or more session identifiers at the browser program for use in transmitting subsequent service requests to the server.

59. The method of claim 1, wherein the uniform resource locator includes a transfer protocol identifier, a host name, one or more directory names, and a file name.

60. The method of claim 59, wherein the session identifier is appended to the path name in the uniform resource locator between the transfer protocol identifier and the file name.

61. The method of claim 1, wherein the server system tracks access history information within a client-server session.

62. The method of claim 61, wherein the access history information is used to charge for advertising on the server system.

63. The method of claim 62, wherein the amount to charge for advertising is based on a number of link traversals from an advertising page to a product page.

64. The method of claim 62, wherein the amount to charge for advertising is based on a count of purchases resulting from a path including an advertisement.

65. The method of claim 1, wherein the server system includes a content server and an authorization server, the content server receives the service request from the client and causes one or more client authentication parameters to be forwarded to the authorization server for authorization, the authorization server in turn returns the session identifier to the client.

66. The method of claim 65, wherein the request with the session identifier is transmitted from the client to the content server.

67. The method of claim 66, wherein the session identifier includes a plurality of information fields and a digital signature, and wherein the content server receives the request with the session identifier and compares the digital signature with a computed digital signature of the information fields in order to verify the session identifier.

68. The method of claim 65, wherein the authorization server queries a user account database and compares data *stored therein with the one or more client authentication parameters in order to authorize the client service request.*

69. The method of claim 68, wherein the user account database includes a user identifier and a password.

70. The method of claim 68, wherein the user account database includes demographic information regarding the user of the client.

71. The method of claim 68, wherein the user account database includes a network address of the client.

72. The method of claim 71, wherein the network address is an Internet Protocol address.

73. The method of claim 65, further comprising the steps of:

determining that the client is not authorized to access the content server; and

the authorization server prompting the client to setup an account with the authorization server in order to become authorized to access the content server.

74. The method of claim 1, wherein the session identifier enables the client to access files within a protection domain.

75. The method of claim 74, wherein the protection domain includes a plurality of servers.

76. The method of claim 1, wherein the client is operating a web browser, and the server system is a web server, and wherein the session of requests include a plurality of hypertext transfer protocol GET requests transmitted from the client web browser to the web server, each of the GET requests including a uniform resource locator having the session identifier appended thereto.

77. The method of claim 65, wherein the content server transmits a hypertext transfer protocol REDIRECT command back to the client that causes the client to transmit the one or more client authentication parameters to the authorization server.

78. The method of claim 1, wherein the service request causes the server to transmit a document to the requesting client.

79. The method of claim 78, wherein the document is customized for the client by the server, prior to transmission, based upon the session identifier.

80. The method of claim 79, wherein the customized document is a web page, and the web page is customized based upon a user identifier encoded within the session identifier.

81. The method of claim 79, wherein the customized document is a web page, and the web page is customized based upon a user profile associated with the session identifier.

82. The method of claim 1, wherein the session identifier is provided to the client prior to or without a credential check procedure being performed between the client and the server.

83. The method of claim 82, wherein the credential check procedure includes a request for user name and password from the client.

84. The information system of claim 32, wherein the session identifier includes a user identifier.

85. The information system of claim 32, wherein the session identifier includes an expiration time for the session.

86. The information system of claim 36, further comprising means for tracking the access history to determine service requests leading to a purchase made within the session of requests.

87. The information system of claim 33, wherein the server system maintains a data base relating customer information to access patterns.

88. The information system of claim 87, wherein the information includes customer demographics.

89. The information system of claim 33, wherein the server system comprises plural servers including an authentication server which provides session identifiers for service requests to multiple servers.

90. The information system of claim 32, further comprising:

means for directing the service request to a first server which is to provide the requested service;

the first server including a means for checking the service request for a session identifier and for only servicing a service request having a valid session identifier, and where the service request has no valid identifier:

the first server redirecting the service request from the client to the authorization server;

the authorization server subjecting the client to the authorization routine and issuing the session identifier to be appended to the service request to the first server;

the client forwarding the service request appended with the session identifier to the first server; and

the first server recognizing the session identifier and servicing the service request to the client; and

the client including a means for appending the session identifier to subsequent service requests to the server system.

91. The information system of claim 90, wherein the session identifier includes a user identifier.

92. The information system of claim 90, wherein the session identifier includes an expiration time for the session.

93. The information system of claim 90, wherein the session identifier provides access to a protected domain to which the session has access authorization.

94. The information system of claim 93, further comprising a means for modifying the session identifier for access to a different protected domain.

95. The information system of claim 90, wherein the session identifier provides a key identifier for key management.

96. The information system of claim 90, wherein the server system includes a means for recording information from the session identifier in a transaction log in the server system.

97. The information system of claim 90, wherein the client includes a means for modifying the path name of a current uniform resource locator using relative addressing and for retaining the session identifier portion of the path name unmodified for successive requests in the session.

98. The information system of claim 32, wherein:

the server system subjects the client to an authorization routine prior to issuing the session identifier and the session identifier is protected from forgery, records information from the session identifier in a transaction log in the server system, tracks request paths relative to hypertext pages, and maintains a data base relating customer demographics to access patterns; and

the client modifies the path name of a current uniform resource locator using relative addressing and retains the session identifier portion of the path name unmodified for successive requests in a session.

99. The information system of claim 32, wherein the session identifier includes a key identifier.

100. The information system of claim 32, wherein the session identifier includes an Internet Protocol address of the client.

101. The information system of claim 32, further comprising means for digitally signing the session identifier prior to appending it to the uniform resource locator.

102. The information system of claim 101, wherein the session identifier includes a plurality of information fields and is digitally signed by performing a hash computation on the information fields.

103. The information system of claim 102, wherein the information fields of the session identifier include a user identification field and an expiration time field.

104. The information system of claim 102, wherein the information fields of the session identifier include a network address field and a key identifier field.

105. The information system of claim 102, wherein the information fields of the session identifier include a domain field and a network address field.

106. The information system of claim 32, further comprising:

means for determining that the service request is from an unauthorized user of the server; and

means for prompting the client to become an authorized user of the server by providing access credentials, the access credentials including a user identifier and a secret key;

means for validating the access credentials at the server; and

means for transmitting a hypertext transfer protocol REDIRECT command back to the client along with the session identifier, wherein the REDIRECT command includes a uniform resource locator having the session identifier appended thereto.

107. The information system of claim 106, further comprising:

means for receiving the REDIRECT command at the client and for processing the command using a web browser application operating at the client, the web browser application issuing a hypertext transfer porotocl GET command in response to the REDIRECT command, the GET command including the uniform resource locator with the appended session identifier.

108. The information system of claim 35, wherein the information recorded in the transaction log includes the network address of the client.

109. The information system of claim 33, wherein the session identifier includes an access domain to which the client is authorized to gain access, further comprising:

means for generating a relative uniform resource locator link at the client, the relative uniform resource locator link including the session identifier;

means for transmitting the relative uniform resource locator link to the server system;

means for determining whether the relative uniform resource locator link is pointing to a hypertext page in the same access domain as that identified in the session identifier;

means for accepting or denying the link, and if the link is accepted for transmitting the hypertext page pointed to by the link.

110. The information system of claim 109, further comprising:

means, responsive to the link being denied, for transmitting a hypertext transfer protocol REDIRECT command to the client, the REDIRECT command including a uniform resource locator of an authorization server.

111. The information system of claim 32, further comprising:

a browser program at the client; and

means for storing one or more session identifiers at the browser program for use in transmitting subsequent service requests to the system.

112. The information system of claim 32, wherein the uniform resource locator includes a transfer protocol identifier, a host name, one or more directory names, and a file name.

113. The information system of claim 112, wherein the session identifier is appended to the path name in the uniform resource locator between the transfer protocol identifier and the file name.

114. The information system of claim 33, wherein the server system tracks access history information within a client-server session.

115. The information system of claim 114, wherein the access history information is used to charge for advertising on the server system.

116. The information system of claim 115, wherein the amount to charge for advertising is based on a number of link traversals from an advertising page to a product page.

117. The information system of claim 115, wherein the amount to charge for advertising is based on a count of purchases resulting from a path including an advertisement.

118. The information system of claim 33, wherein the server system includes a content server and an authorization server, the content server including means for receiving the service request from the client and for causing one or more client authentication parameters to be forward to the authorization server for authorization, the authorization server including means for returning the session identifier to the client.

119. The information system of claim 118, wherein the request with the session identifier is transmitted from the client to the content server.

120. The information system of claim 119, wherein the session identifier includes a plurality of information fields and a digital signature, and wherein the content server receives the request with the session identifier and compares the digital signature with a computed digital signature of the information fields in order to verify the session identifier.

121. The information system of claim 118, wherein the authorization server includes a means for querying a user account database and for comparing data stored therein with the one or more client authentication parameters in order to authorize the client service request.

122. The information system of claim 121, wherein the user account database includes a user identifier and a password.

123. The information system of claim 121, wherein the user account database includes demographic information regarding the user of the client.

124. The information system of claim 121, wherein the user account database includes a network address of the client.

125. The information system of claim 124, wherein the network address is an Internet Protocol address.

126. The information system of claim 118, further comprising:

means for determining that the client is not authorized to access the content server; and

the authorization server including means for prompting the client to setup an account with the authorization server in order to become authorized to access the content server.

127. The information system of claim 32, wherein the session identifier enables the client to access files within a protection domain.

128. The information system of claim 127, wherein the protection domain includes a plurality of servers.

129. The information system of claim 33, wherein the client is operating a web browser, and the server system is *a web server, and wherein the session of requests include a plurality of hypertext transfer protocol GET requests transmitted from the client web browser to the web server, each of the GET requests including a uniform resource locator having the session identifier appended thereto.*

130. The information system of claim 118, wherein the content server transmits a hypertext transfer protocol REDIRECT command back to the client that causes the client to transmit the one or more client authentication parameters to the authorization server.

131. The information system of claim 33, wherein the service request causes the server to transmit a document to the requesting client.

132. The information system of claim 131, wherein the document is customized for the client by the server, prior to transmission, based upon the session identifier.

133. The information system of claim 132, wherein the customized document is a web page, and the web page is customized based upon a user identifier encoded within the session identifier.

134. The information system of claim 132, wherein the customized document is a web page, and the web page is customized based upon a user profile associated with the session identifier.

135. The information system of claim 32, wherein the session identifier is provided to the client prior to or without a credential check procedure being performed between the client and the server.

136. The information system of claim 135, wherein the credential check procedure includes a request for user name and password from the client.

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